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95 RF 05311

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ADMIN RECORD

June 22, 1995 95-RF-05311

B. C. Wu
Manager Operable Unit 4
Environmental Restoration Division
DOE, RFFO

INITIATING DISPUTE FOR OPERABLE UNIT 4 PONDCRETE DETERMINATION - SRK-089-95

Action: Initiate Dispute with Regulators

This letter provides documentation for initiating a dispute with the Colorado Department of Public Health and Environment (CDPHE) and the Environmental Protection Agency (EPA) in regards to CDPHE's determination that pondcrete is not a remediation waste. A draft transmittal to the regulators is attached for your convenience.

Background

On May 11, EG&G recommended that the Department of Energy (DOE) initiate dispute (95-RF-04191) with the regulators regarding the CDPHE determination that pondcrete is not a remediation waste. To ensure a broad area for discussion was maintained, EG&G suggested the dispute be initiated over the CDPHE failure to provide a written explanation of their position, as was promised to the DOE. We recommended that DOE use the Interagency Agreement (IAG) paragraph 92, which allows DOE to dispute any action (which EG&G feels includes inaction) taken by the State in accord with IAG Chapter 4, Integration of EPA and State responsibilities. Such dispute must be initiated within 14 days of the (in)action.

EG&G recommended initiating the dispute on the basis of verbal information that the CDPHE would not provide the promised explanation of their pondcrete decision. We understand DOE was concerned that the lack of a written communication could make it difficult to prove the DOE acted within 14 days as required by the IAG. While EG&G continued to recommend, in discussions with DOE staff, that the dispute be initiated immediately, we also assisted DOE in preparing a letter (95-DOE-08441) to provide a date to count from. The letter requested the promised information from the State by June 16. To our knowledge, no information has been received. We understand informally that DOE plans to initiate dispute by June 30 to meet the timing requirements of the IAG.

Recommendation

EG&G recommends DOE initiate dispute immediately as explained in our letter of May 11. Despite various alternatives under review at this time, the baseline plan for Operable Unit 4

(OU 4), as documented, for example, in Activity Description Sheet 1258, leads to a $40 to $50 million cost avoidance when pondcrete is categorized as remediation waste. EG&G feels that failure to pursue the issue would leave DOE open to criticism.

S. R. Keith
Program Manager
Solar Pond Projects

KCL:pjm

Attachment:
As Stated

Orig. and 1 cc - B. C. Wu

cc:

S.	Howard	-	DOE, RFFO (SAIC)
F.	Lockhart	-	DOE, RFFO
J.	Roberson	-	DOE, RFFO
S.	Surovchak	-	DOE/PMD
J.	Wienand	-	DOE, RFFO
D.	Steffen	-	RMRS, LLC

DRAFT DRAFT DRAFT

Joe Schieffelin, Unit Leader
Rocky Flats Unit
Facilities Section
Hazardous Material and Waste Management Division
4300 Cherry Creek Drive South
Denver, CO 80222-1530

STATUS OF PONDCRETE AS REMEDIATION WASTE

Dear Mr. Schieffelin:

The Department of Energy (DOE) has received your letter of April 11, 1995. The Division provided comments both in the body of the letter and the attachment. In particular, the letter provided the Division's determination that sludge is a remediation waste but pondcrete is not a remediation waste under 6 CCR 1007-3 Part 260. DOE feels the Division has omitted certain information from the determination on pondcrete and will document our position in the Draft Responsiveness Summary.

Per your comments on the Proposed Decision Document, the Division committed to transmit details on their pondcrete position. In our letter of June 8, 1995 DOE requested the promised information by June 16. No information has been received to date and we now understand unofficially that no further information will be forth-coming. The Division's decision to not transmit the details is an action under the Rocky Flats Interagency Agreement, 92. DOE hereby invokes the dispute resolution process under 92. A Written Statement of Dispute is attached.

We would like to begin reasonable efforts to resolve this dispute immediately. Please contact Dr. Briand C. Wu on 966-5899 at your earliest convenience to begin the process.

Attachment

cc

H.	Ainscough	-	CDPHE
A.	Duran	-	EPA
M.	Hestmark	-	EPA
S. R.	Keith	-	EG&G
J. A.	Ledford	-	EG&G
K.	Peter	-	EG&G
S.	Stiger	-	EG&G
D.	Steffen	-	RMRS
S.	Howard	-	SAIC
S.	Surovchak	-	RFFO
B.	Wu	-	RFFO

DRAFT DRAFT DRAFT

RFETS
Written Statement of Dispute
Operable Unit 4
Solar Evaporation Ponds

Nature of Dispute: The State of Colorado has determined that pondcrete does not meet the definition of remediation waste. The State's commitment to provide DOE with information on the basis for this determination has not been fulfilled.

DOE's Position: Pondcrete stored at RFETS meets the definition of remediation waste. No change to the OU 4 Proposed Decision Document is required. Information and reasoning that may challenge the DOE position has been withheld by the State.

Information Relied Upon: The DOE feels there is a strong regulatory basis for defining pondcrete as remediation waste. The DOE has not received a regulatory rebuttal.

used for further adjustments in slurry density, blending of clarifier and 207C Pond materials, and to hold materials pending the results of laboratory tests. In tanks #2&3, TSS (Total Suspended Solids) and TDS (Total Dissolved Solids) are monitored and adjusted, as needed. TSS is adjusted with brine addition from 207C, and TDS, by 207B water.

Following these adjustments, the slurry is piped 1200 feet to the 750 Pad area to Averaging Tanks #4&5 and #6&7. These averaging tanks on the 750 Pad are used for slurry batch feed to the RCM cement mixer (see Appendix D). While one pair of these tanks is filling, the other pair is feeding the RCM.

1.5.1.4 POZZOLAN STAGING AND MIXING

In a separate processing unit, cement, flyash, and lime reagents are brought by trucks to storage bins located near the 750 Pad. Each of the reagents are pneumatically conveyed in carefully proportioned amounts from the respective storage bins to a surge bin containing the blended reagents. The mixture of the blended reagents is called the pozzolan.

1.5.1.5 CEMENTING

Mixing of the 207C Pond and clarifier materials, and blended cement reagents occurs in the Recirculating Cement Mixer (RCM). In the RCM, the cemented waste form is first created by the blending of 207C Pond and clarifier materials with cement, flyash, and lime (called pozzolan) in carefully controlled proportions. The output of the RCM goes to the Casting Station as a castable cement mixture. The process is designed to produce one half-crate every 6 to 10 minutes.

The RCM is a high-capacity mixer which has a design capacity of 200-400 gallons per minute that is substantially higher than the process rate of 20 gallons per minute. Since the RCM cannot be supplied slurry on a continuous basis by the upstream reclaim, chlorination, and slurry densification, and laboratory analyses operations, averaging tanks are used. Thus, 207C and clarifier material must be held in averaging tanks for batch feeding to the RCM.

Also, the RCM must undergo a cleaning process every two to three hours. During cleaning, the RCM is emptied, and flushed with water. Multiple water flushes, high-pressure water jets, or manual removal of adhering incrustations may be needed to clear the RCM of material accumulations.

1.5.1.6 CASTING

Empty half crates are brought to Station 1 of the Casting Area by EG&G forktruck. The lid is removed and the liner prepared to receive the castable cement mixture.

At Station 2, a plastic "bladder" inside the half-crate is filled from a nozzle leading from the cement mixer. The plastic bladder is used to control splashing and emissions. This bladder has a nozzle to receive cement waste, and a second nozzle to allow bladder ventilation through a HEPA-filtered vacuum for emissions control. An HNUS Operator controls the flow of product into the bladder while EG&G Chemical Operators observe the fill and cleanup any splash.

At Station 3, EG&G Operators seal the inner plastic liner, and place the inner cardboard top over the plastic liner. An EG&G Waste Inspector observes the operation, and signs off on a traveler form for the filled half-crate.

At Station 4, EG&G Carpenters place the top on the half-crate, and apply steel banding. This operation is also observed and receives sign off by a Waste Inspector.

At Station 5, EG&G Radiological Protection Technologists will perform radiological surveys on the half crates per EG&G ROI's. The product of Station 5 is a filled, sealed, banded, tested, and signed half-crate which is transported to the storage area.

1.5.1.7 DENSOMETER

A Radioactive Densometer is used as part of the Solar Pond Processing equipment to monitor the density of the SEP material during densification. The Densometer contains radioactive sources enclosed in shielding material. Use, care, and maintenance of the Densometer is conducted in accordance with the Radioactive Densometer Handbook, Halliburton Services and EG&G Health and Safety Practices Manual Section 18.13, "Field Radiography Using Radioactive Sources". No significant radiation exposure to personnel is anticipated from use of the Densometer.

1.5.2 207 A&B PONDS PROCESSING

1.5.2.1 PRECONSOLIDATION OF PONDS

Using reclaim pumps for water and sludge, the 207A and 207B-C Ponds will be emptied. Pumping will also occur on the 207B-N and

207B-S Ponds to separate sludge from water. The sludge from 207A and B Ponds will be consolidated into the 207B-S Pond, and the water, into the 207B-N Pond.

1.5.2.2 CHLORINATION

The consolidated ponds will receive in-situ chlorination by hydraulically driven submersible pumps. The pumps will be on a rigid floating pontoon platform. Motorized vehicles will pull the floating pontoon across the pond, as the pumps take in surface liquid and discharge in a subsurface direction to achieve turn over of the bottom sludge. Commercial calcium hypochlorite crystals called CCH will be transferred by a pneumatic conveyance system from the pond berm into the edge of the pond, and if necessary, to the center of the pond. See Appendix D.

1.5.2.3 RECLAIM

A pond water reclaim pump system will transfer pond water to a process water tank. The reclaimed slurry is pumped to a scalping screen where oversize and trash materials are removed by mechanical trash screenings. A skid underneath will contain any material resulting from pump leakages or from pump maintenance. Oversize reclaimed material is transferred to a half-crate . The trash and oversize material in the half-crate will be handled by EG&G for later disposition. Pond side walls are flooded with water to remove residual sludge from the emptied pond. The undersize slurry is pumped through a pipeline to a gravity settling tank. All piping (with the exception of flexible hoses used within a contained process unit) will be double-walled.

1.5.2.4 PRECONDITIONING

In the gravity settling tanks, additional sludge and water separation occurs. Sludge material settles to the bottom of the tank, while water flows over an internal weir. The water is pumped back to the pond, and the sludge is pumped through a sump and mixer into a rotary screen thickener.

1.5.2.5 DEWATERING

The rotary screen thickener receives the preconditioned sludge material. It serves to dewater and to densify the low-density sludge. The densified sludge is pumped from the thickener to the slurry surge tank which feeds the cement mixer.

1.5.2.6 POZZOLAN STAGING AND MIXING

In a separate processing unit, cement, flyash, and lime reagents are brought by trucks to storage bins located near the 750 Pad. Each of the reagents are pneumatically conveyed in carefully proportioned amounts from the respective storage bins to a surge bin containing the blended reagents. The mixture of the blended reagents is called pozzolan.

1.5.2.7 CEMENTING

Mixing of the 207A and B Pond dewatered slurry, and the blended cement reagents occurs in the cement mixer. In the cement mixer, the cemented waste form is first created by the blending of pond slurry with cement, flyash, and lime (called pozzolan) in carefully controlled proportions. The output of the cement mixer goes to the Casting Station as a castable cement mixture which is poured into half-crates.

1.5.2.8 CASTING

Empty half crates are brought to Station 1 of the Casting Area by EG&G forktruck. The lid is removed, and the liner prepared to receive the castable cement mixture.

At Station 2, the half-crate is filled from a nozzle leading from the cement mixer. An HNUS Operator controls the flow of product into the half-crate, while two EG&G Chemical Operators observe the fill, cleanup any splash, and push product into the box corners.

At Station 3, EG&G Operators seal the inner plastic liner, and place the inner cardboard top over the plastic liner. An EG&G Waste Inspector observes the operation, and signs off on a traveler form for the filled half-crate.

At Station 4, EG&G Carpenters place the top on the half-crate, and apply steel banding. This operation is also observed and receives sign off by a Waste Inspector.

At Station 5, EG&G Radiological Protection Technologists will perform radiological surveys on the half-crates per EG&G ROI's. The product of Station 5 is a filled, sealed, banded, tested, and signed half-crate which is transported to the storage area.

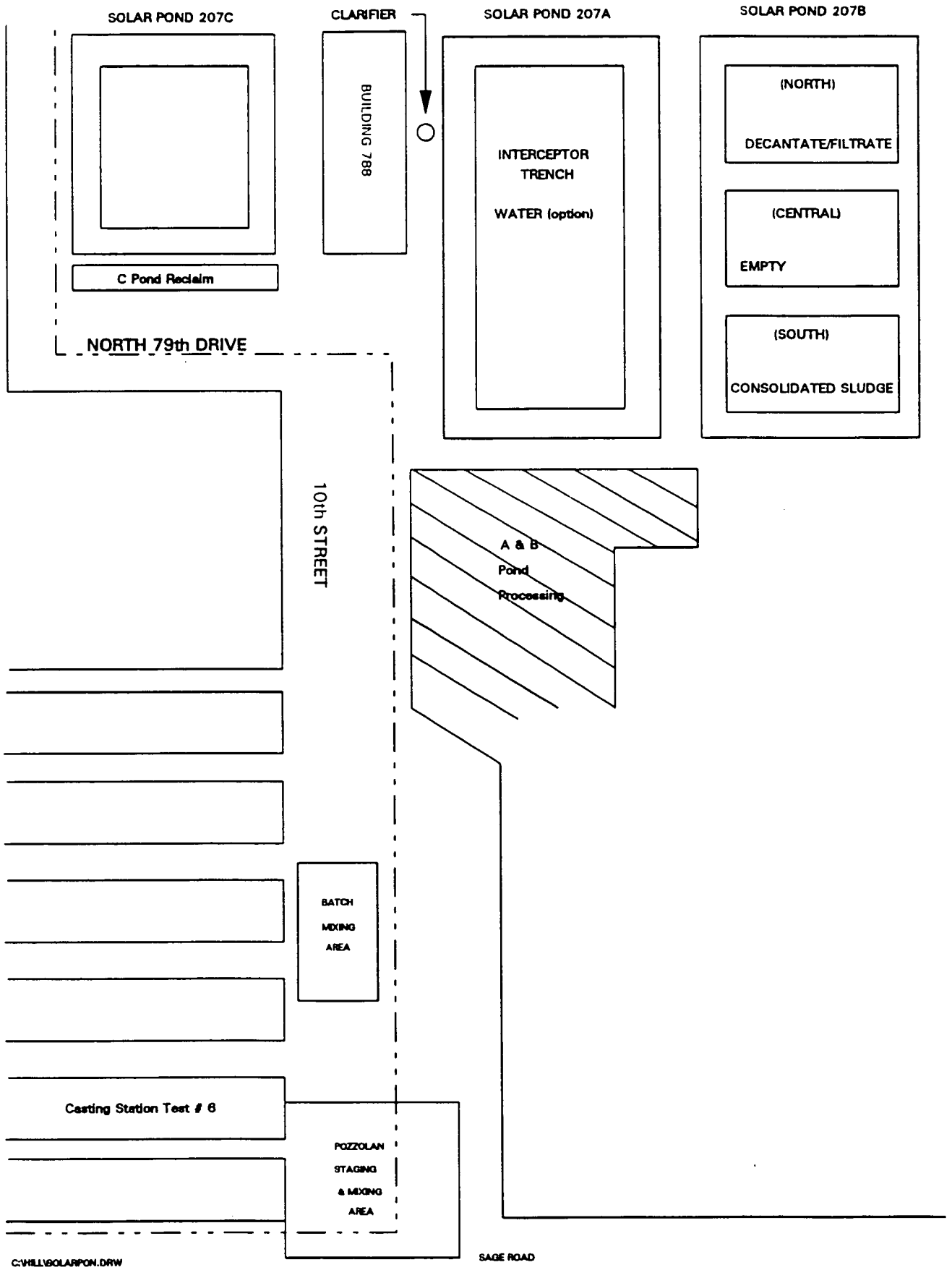

Figure 1.5-1
Layout of Solar Ponds Processing Areas

PONDS 207 C, CLARIFIER

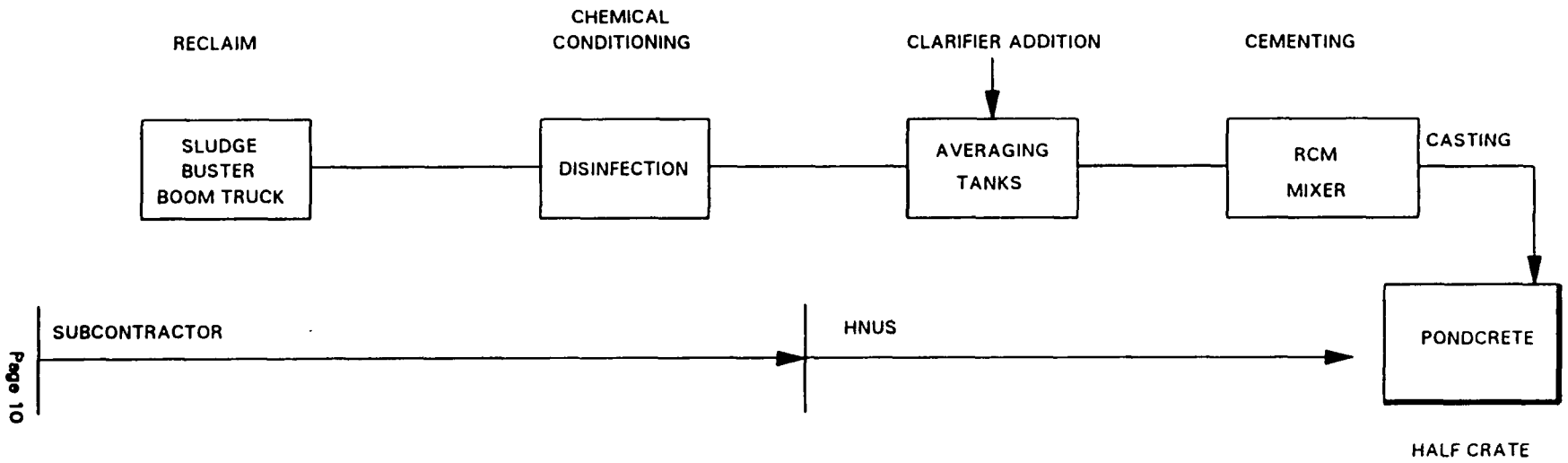

Figure 1.5-2
Block Diagram of 207C Pond and Clarifier Processing

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UNIT PROCESSING

PONDS 207 A & B

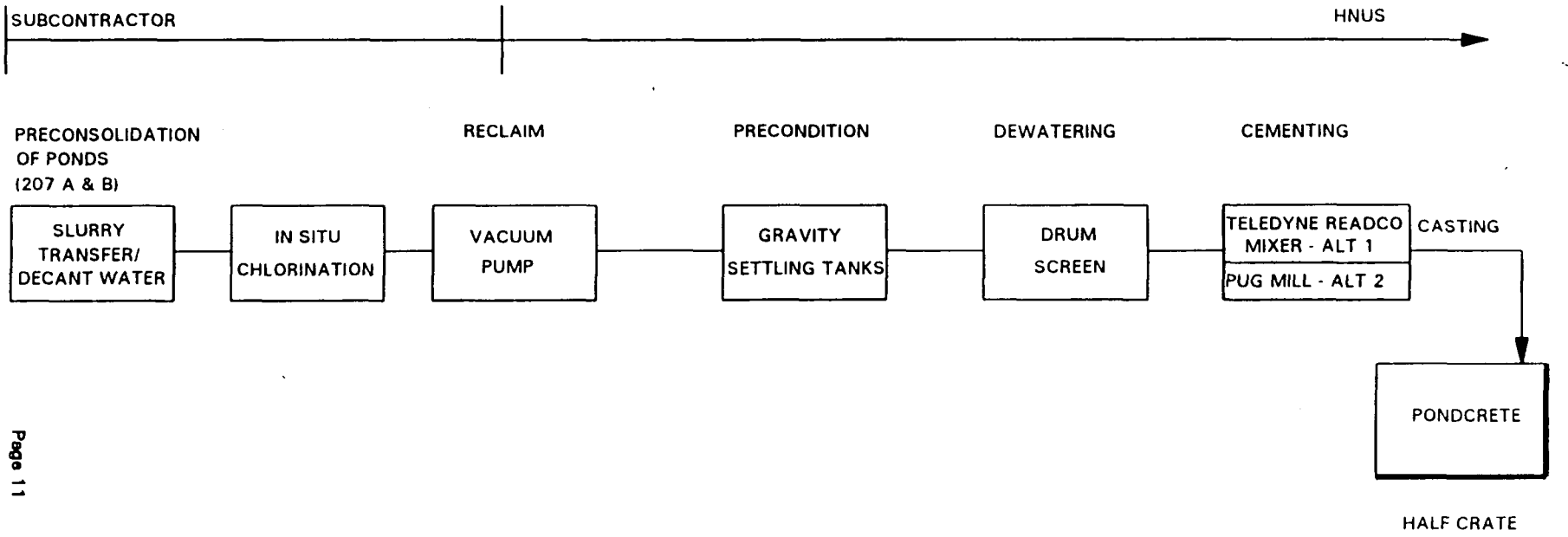

Figure 1.5-3
Block Diagram of 207 A&B Ponds Processing Areas

1.6 ANALYTICAL DATA

Available chemical and radiological sampling results were collected in order to assess the potential chemical and radiological hazards at the site. Chemical and radiological testing was conducted on the Pondcrete and the pondsludge to characterize the waste for disposal. In addition, industrial hygiene sampling performed in February, 1990 for dust and chemical contaminants was conducted during Pondcrete testing inside the Permacon in tent 5 on the 750 Pad, in building 788 and during several phases of Pondcrete handling inside the tent 5. The results of these analyses are provided in Section 3 of this document. Additional air monitoring is currently underway to further characterize potential exposures associated with the actual production of Pondcrete.

1.7 RECORD OF CHANGES

The HASP is meant to be a dynamic document, and shall be updated or changed whenever necessary to improve or initiate procedures beneficial to health and safety activities. However, any changes or deviations shall be formally approved using the forms in Section 1.8. A documentation of changes must be kept on the following record form. Changes should be made in ink to the text of the HASP to alert the reader to changes in the document. The field change form shall be included in Section 1.8 of the HASP for reference. This shall be issued by HNUS as a controlled document.

RECORD OF FIELD CHANGES

Initial for attaching any Field Changes to this HASP. Enter the Field Change Number and Date Issued. File the completed field changes to this HASP in Section 1.8. Make PEN AND INK changes in the text to alert the reader to the changes as required in the Field Change.

FIELD CHANGE NUMBER	DATE ENTERED	SYNOPSIS OF CHANGE	INITIAL

1.8 FIELD CHANGE FORM

The attached forms shall be used to change or update the HASP. Anyone can initiate a change in the HASP by filling out the HASP FIELD CHANGE form and submitting it to the HNUS Site Health and Safety Supervisor (SHSS). The SHSS will review the change and submit for approval using the HNUS HASP field change form. Interim approval and implementation of the change can be implemented by approval signatures by the HNUS Site Health and Safety Supervisor, the HNUS Deputy Project Manager, EG&G Project Manager and WS Operations Manager. Before the change becomes final, the EG&G Health and Safety Liaison officer shall also approve changes, and obtain the appropriate EG&G signatures. Once changes are approved and finalized, they will be submitted to the HNUS Document Control Officer for implementation and distribution.

HNUS HASP FIELD CHANGE FORM

Field Change Number: _____ Date Effective: _____

Requested by: _____ _____ _____
Print Signature Date

- Pen and Ink changes to be made to the HASP to alert the reader of this change:

_____

_____

_____

- Reason for the change to be incorporated into the HASP:

_____

_____

_____

- Text of Change to be incorporated:

_____

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HNUS HASP FIELD CHANGE FORM

Field Change Number: _____ Date Effective: _____

HNUS Site Health & Safety Supervisor	Date
HNUS Deputy Project Manager	Date
HNUS Project Manager	Date
HNUS Operations/Maintenance Supervisor	Date
HNUS Quality Assurance Supervisor	Date
HNUS Laboratory Supervisor (If Applicable)	Date
HNUS Resident Engineer (If Applicable)	Date
HNUS Process Control Manager	Date
EG&G Health and Safety Liaison Officer	Date
EG&G WS Operations Manager	Date
EG&G Project Manager	Date

SECTION 2.0 PERSONNEL ASSIGNMENTS

2.1 INTRODUCTION

The Environmental Restoration and Waste Management Division at EG&G Rocky Flats has overall responsibility for the remediation activities at the Solar Evaporation Ponds (SEP) site. General operational responsibilities are under the directorship of the Waste Operations Department. Support services to these operations, and responsibilities for designing health and safety protocols at the plant are assigned to Radiological Engineering, Occupational Health, Occupational Safety, Industrial Hygiene and Health & Safety Area Engineering.

Halliburton NUS Environmental Corporation (HNUS) is contracted to EG&G to process SEP waste forms into a final waste form. To accomplish this task, HNUS is responsible for the design, provision and installation of processing equipment; and also for provision of experienced personnel to operate the SEP remediation equipment.

Personnel health and safety is a line management responsibility. Each line manager is accountable to higher management for carrying out his/her assigned work in a safe manner and for protecting personnel from exposure to undue risks. SEP site managers are expected to effectively utilize the services and expertise of the EG&G Health and Safety Area Administrator and the HNUS Site Health & Safety Supervisor to carry out these responsibilities.

2.2 EG&G MANAGEMENT AND PERSONNEL FOR SEP SITE

The following EG&G project-related health and safety personnel have been identified at the SEP site:

FUNCTION	NAME	PHONE EXT.*	DIGITAL PAGER**
Project Manager	Don Ferrier	6456	1841
Operations Manager	Joe Roberts	6129	3562
Deputy Operations Manager	S. W. Dewitt	4433	0384
Site Operations Supervisor	Dean Pierson		1369
Shift Managers	Charles Turner	5755	4001
Site Foreman	--	4325 & 6055	--
Chemical Operators	--	4325 & 6055	--
Health & Safety Area Administrator	Pat Stephens	4831	3307
Industrial Hygiene Representative/Site Health & Safety Coordinator	Brian Fielding	5471	3063
Industrial Safety	Dan Stokes	4233	1656
Health & Safety Liaison Officer	J.S. VanMeighem	5810	3055
Radiological Operations Foreman	Bill Bailey	--	--
Radiological Engineering Representative	Richard Norton	4075	0971
Radiological Protection - Section Manager (Radiological Protection Technicians)	Debbie Davidson	5772	1509
Environmental Restoration Representative	Ernie Lombardi	7298	0112
Permitting & Compliance Representative	Carl Russell	3391	1144
Occupational Health Director	Dr. Furman	2895	2356
Fire Protection Representative	Keith Miller	6042	0024
Operational Meteorologist	Steve Balint	2453	--

* When dialing from off-site, use a 966 prefix

** To access the paging system from off-site, dial 966-4000, then digital pager number. On-site dial 4000, than the digital pager number.

2.3 ASSIGNMENT OF RESPONSIBILITIES FOR EG&G

Each of the above noted EG&G organizations and individuals have defined health and safety roles and responsibilities for the project. In many cases, HNUS and EG&G personnel will work cooperatively on health and safety tasks. Additional descriptions of individual responsibilities are given in Appendix B.

2.4 ASSIGNMENT OF RESPONSIBILITIES FOR HALLIBURTON NUS (HNUS) ENVIRONMENTAL PERSONNEL

HNUS staff for the SEP and Pondcrete/Saltcrete project include the following:

Program Manager ---------- Dave Dougherty
Project Manager ---------- Ted Bittner
Deputy Resident Project Manager --- John Schmidt
Off-Site Project Manager ---------- Don Brenneman
Process Development Manager ------- Don Brenneman (acting)
Engineering Manager ---------- M. Gibbs
Brown & Root Engineering Manager -- John Zak
Laboratory Manager (Off-Site) ----- Dave Simanic
Contract Administrator ---------- R. Orwig
Process Control Manager ---------- Arnie Allen
Operations/Maintenance Manager ---- Jim DePriest
Resident Engineer ---------- Jack Templeton
Laboratory Manager (On-Site) ------ Frank B. Stencer
Quality Assurance Supervisor ------ Elmer Dover
Health & Safety Supervisor -------- Ron Hill
Director, Health & Safety --------- Tom Samson
Administrative Manager ---------- Roger Hiss
Health & Safety Document Control -- Toni Wightman

HNUS personnel responsibilities and reporting lines of the staff are indicated in Figure 2.4-1, and described in Appendix C.

HNUS SEP ORGANIZATIONAL CHART
FOR PROCESSING 207C POND/CLARIFIER

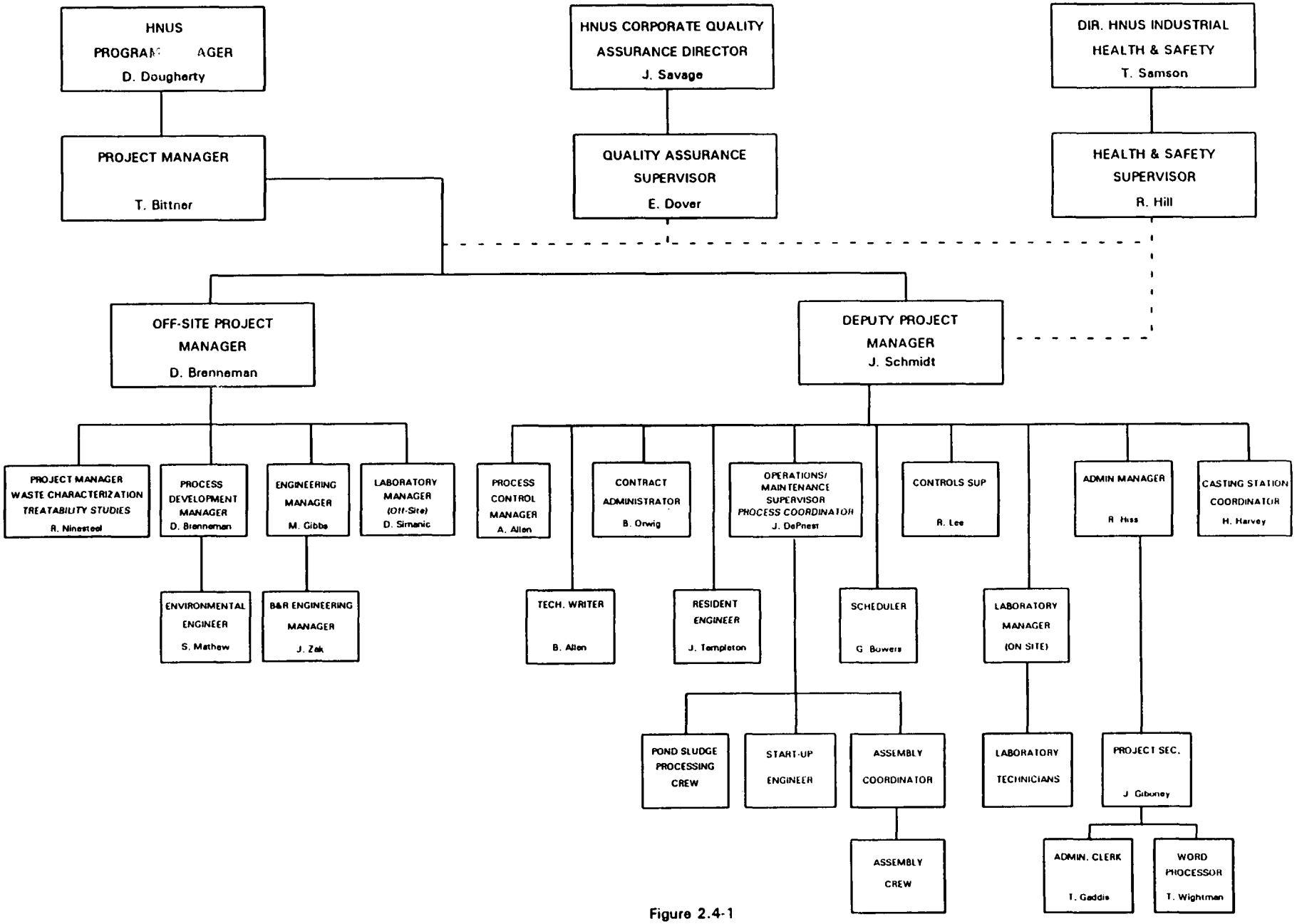

Figure 2.4-1
HNUS SEP Project Organizational Chart

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SECTION 3.0 HAZARD ASSESSMENT

3.1 INTRODUCTION

The potential hazards associated with processing the solar pond's water and sludge include exposure to chemical and radioactive materials, heat, cold, physical stress, and physical hazards.

The toxic chemical and radiological hazard assessment of ponds 207A, 207BN, 207BC, 207BS, and 207C is supported by analytical data obtained from pond sampling conducted in May 1991. These data were reported in the List of Reports — (Data Summary for Solar Evaporation Ponds) issued by EG&G in October, 1991.

In addition, on January 6, 1992, the HNUS Pittsburgh Laboratory issued Pond Sludge Characterization Report and Clarifier Sludge Waste Characterization Report, Deliverable (Combined 224A and 224E), Revision 0 for Review. Both of these documents were reviewed to obtain information for chemical and radiological characterization of pond materials for this HASP. The radiological data was updated on May 8, 1992 to incorporate newly received information from the HNUS laboratory (per R. Ninesteel, 4/29/92).

3.2 CHEMICAL HAZARDS

The chemical compounds and metals detected at levels greater than the U.S. EPA (Environmental Protection Agency) waste disposal limits, and toxicity characteristic limits are listed in Table 3.2-1.

Additional data on chemical compounds in SEP water and sludge that exceed EPA LDR and TCLP limits are included in Tables 3.2-2 through 3.2-5. For comparative purposes, Table 3.2-6 lists EPA drinking water standards for target chemicals. The EPA has established treatment standards for all listed and characteristic wastes destined for land disposal. These are called Land Disposal Restrictions (LDR). These concentration levels and treatment methods are intended to diminish the toxicity of wastes, or to reduce the likelihood of waste migration from a disposal site. In order to meet requirements of the regulations, and to produce a certifiable waste form from SEP clean-up, the SEP waste forms are tested using the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP is an analytical method used to determine whether the concentrations of hazardous constituents in a waste extract, or an extract of the treatment residual meet LDR standards for waste disposal. Waste forms failing the TCLP test must be treated and made to pass the TCLP test in order to comply with LDR standards. Wastes that do not meet the LDR treatment requirements are prohibited from land disposal.

A physicochemical hazard stems from the high pH of 10.2 found in 207C pond water. Exposure pathways for chemically toxic and radioactive materials are inhalation, ingestion, and skin contract. Water spray generated by wind and equipment operation offer the greatest potential for skin contract. The protection against splash and other exposure pathways will come about from engineering and administrative controls. When these controls are not feasible or adequate, personal protective equipment (PPE) will be used.

Although cyanide is present in 207C solar pond water, release as hydrogen cyanide is highly unlikely. This is due to the high pH that has been measured in 207C water samples. As long as no acids are used during the sampling and processing activities; i.e., as a preservative, there should be no possibility of cyanide release that would be expected as a result of acidification.

TABLE 3.2-1
SUMMARY OF SOLAR POND SAMPLES EXCEEDING REGULATORY STANDARDS

MEDIA	POND	LDR STANDARD EXCEEDED?	TCLP STANDARD EXCEEDED?[1]	OTHER HAZARDOUS MATERIALS FOUND
Water	207A	No	No	---
	207B-North	No	No	---
	207B-Center	No	No	Chromium [3]
	207B-South	No	No	Chromium [3]
	207C	Yes (2-Butanone, Cyanide-Total, Chromium, Lead, Nickel)	Yes (Arsenic, Chromium)	Cadmium [3]
	Clarifier	Yes (Cyanide-Total, Chromium, Lead)	No	---
Sludge	207A	Yes (Cadmium)	No	---
	207B-North	Yes (Cadmium)	No	Chromium, Lead [3]
	207B-Center	Yes (Cadmium)	No	Tetrachloroethene, Chromium, Lead [3]
	207B-South	No	No	Tetrachloroethene, Cadmium, Chromium, Lead, Silver [3]
	207C	Yes (Cadmium, Nickel)	Yes (Cadmium)	Chromium, Lead, Silver [3]
	Clarifier	Yes (Cadmium, Nickel) [2]	Yes (Cadmium)	Tetrachloroethene [2]

(1) Waste is a RCRA (EPA Resource Conservation and Recovery Act) hazardous waste based on the characteristic of toxicity.

(2) Tetrachloroethene (PCE) was detected in one clarifier sludge sample at a concentration (1000 ug/kg) that is greater than or equal to 20 times the CCWE standard for PCE (50 ug/l).

(3) These results are from the WESTON samples of May, 1991. Although the analytical techniques used do not permit the results to be directly compared to standards for regulatory compliance, a screening at results compared to LDR standards (called CCW in the WESTON Data Report) were exceeded by the chemicals listed.

Source: (1) Deliverable (Combined) 224A and 224E POND SLUDGE AND CLARIFIER SLUDGE WASTE CHARACTERIZATION REPORT, prepared by EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992; and

(2) Table 1 -- Compounds Detected in the 207 Ponds with Concentration Greater than the CCW level in Parts/Billion; in list of reports - Data Summary for Solar Evaporation Ponds Solar Pond Final Report, EG&G Rocky Flats Plant, Inc., October 1991. (From the WESTON samples of May 1991.)

TABLE 3.2-2
SOLAR POND WATER SAMPLES EXCEEDING LDR STANDARDS

POND	CONSTITUENT	LDR STANDARD (ug/1) [2]	AVERAGE WATER CONCENTRATION (ug/1)
207A	None	--	--
207B-North	None	--	--
207B-Center	None	--	--
207B-South	None	--	--
207C	2-Butanone	50[1]	94
	Cyanide-Total	1200	7,700
	Chromium	320	3,520
	Lead	40	300
	Nickel	440	2,680
Clarifier	Chromium	320	825
	Lead	40	46
	Cyanide-Total	1200	2,720

[1] The LDR standard for 2-butanone is based on the CCWE concentration and assumes that all the 2-butanone was soluble. This conservative assumption is the basis for listing 2-butanone on this table. See the deliverable 224A and 224E for more information.

[2] LDR - Land Disposal Restrictions, 40 CFR, Part 268.

Source: [1] POND SLUDGE AND CLARIFIER SLUDGE
Deliverable (combined) 224A and 224E

WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992.

TABLE 3.2-3
SOLAR POND WATER SAMPLES EXCEEDING TCLP STANDARDS

POND	CONSTITUENT	TCLP STANDARD[1] (ug/1)	TCLP EXTRACT CONCENTRATION[2] (ug/1)
207A	None	--	--
207B-North	None	--	--
207B-Center	None	--	--
207B-South	None	--	--
207C	Arsenic	5000	5510
	Chromium	5000	9160
Clarifier	None	--	--

(1) TCLP - Toxicity Characteristic Leaching Procedure. Waste is a RCRA hazardous waste based on the characteristic of toxicity if the TCLP standard is exceeded.

(2) The TCLP method specifies that for liquids with less than 0.5% solids, the liquid should be filtered through a 0.6-0.8 um glass fiber filter to remove the solids, and then analyzed without extraction.

Source: (1) POND SLUDGE AND CLARIFIER SLUDGE
Deliverable (Combined) 224A and 224E

WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992.

TABLE 3.2-4
SOLAR POND SLUDGE SAMPLES EXCEEDING LDR STANDARDS

POND	CONSTITUENT	LDR STANDARD[1] (ug/1)	AVERAGE SLUDGE TCLP EXTRACT CONCENTRATION (ug/1)
207A	Cadmium	66	485
207B-North	Cadmium	66	79
207B-Center	Cadmium	66	136
207B-South	None	--	--
207C	Cadmium	66	1,490
	Nickel	320	986
Clarifier	Cadmium	66	20,700
	Nickel	320	7,400

(1) LDR - Land Disposal Restrictions, 40 CFR, Part 268.

Source: (1) POND SLUDGE AND CLARIFIER SLUDGE
Deliverable (combined) 224A and 224E

WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992.

TABLE 3.2-5
SOLAR POND SLUDGE SAMPLES EXCEEDING TCLP STANDARDS

POND	CONSTITUENT	TCLP STANDARD (ug/1)	AVERAGE SLUDGE TCLP EXTRACT CONCENTRATION (ug/1)
207A	None	---	---
207B-North	None	---	---
207B-Center	None	---	---
207B-South	None	---	---
207C	Cadmium	1000	5230
Clarifier	Cadmium	1000	20,700

TCLP - Toxicity Characteristic Leaching Procedure
— - No reading

Source: (1) POND SLUDGE AND CLARIFIER SLUDGE
Deliverable (combined) 224A and 224E

WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992.

TABLE 3.2-6

DRINKING WATER STANDARDS FOR SELECTED COMPOUNDS DETECTED IN 207 SOLAR PONDS

METALS	MCL, UG/L	
Arsenic	50	
Cadmium	10	
Chromium	50	
Lead	50	
Nickel	100	
Silver	50	
ORGANICS		
2-Butanone	3000	(Long Term EPA Health Advisory for 10 Kg Child)
Tetrachloroethene	5	
OTHER		
Cyanide	200	

MCL = Maximum Contamination Level in drinking water set by U.S. EPA to prevent adverse health effects with a lifetime of consumption of water below the MCL.

3.2.1 BREATHING ZONE SAMPLES

Industrial hygiene sampling was conducted during several phases of pondcrete operations in February and April 1990. In February, personal breathing zone air samples were collected where pondcrete testing was taking place in Building 788. In April 1990, dust levels were evaluated within Building 788. This sampling was conducted by Occusafe, Inc.

Breathing zone samples collected were analyzed for respirable dust, metals, hydrogen cyanide, and selected organic compounds. The compounds that were monitored were selected based on a review of available bulk sample data and a review of the process. Metals which were analyzed include barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead magnesium, manganese, molybdenum, nickel, selenium, silver, thallium, tin, titanium, vanadium and zinc. Organic compounds evaluated include toluene, carbon tetrachloride, ethylbenzene, acetone, methylene chloride, 1,1,2,2-tetrachloroethane, ammonia, and other unspecified organics. Iron was the only compound detected in these samples. Iron concentrations ranged from 0.008 to 0.003 milligrams per cubic meter (mg/m^3). The OSHA Permissible Exposure Limit (PEL) for iron oxide dust is 10 mg/m^3 (29 CFR, 1910.1000).

Total and respirable dust and quartz concentrations were measured in the breathing zone of workers in Building 788. Seven samples were collected while individuals performed the following tasks: vacuuming; operating a forklift; and loading, banding, moving and weighing Pondcrete boxes. All sample results were below PELs and Threshold Limit Values (TLVs) except for one respirable quartz concentration detected at the PEL of 0.1 mg/m^3 (29 CFR, 1910.1000). This elevated result was attributed to unfiltered vacuum exhaust blowing directly on the sample medium while a worker was vacuuming.

3.2.2 EXPOSURE ROUTES AND HAZARDS

Exposure routes and the hazards associated with specific materials varies by compound, concentration, and the physical nature of the material (gas, solid, liquid). The highest risk of exposure to volatile organic compounds is via vapor inhalation and skin absorption. Risks associated with semi-volatile compounds include dust inhalation, ingestion, and contact. Vapor inhalation is not as high a risk because semi-volatile compounds do not vaporize readily at normal temperatures and pressures. Risks for the metal contaminants are greatest if materials are inhaled or swallowed in sufficient doses. Several of the volatile organic chemicals identified are chlorinated compounds. Typically, chlorinated solvents affect organ systems including the central nervous system, cardiovascular system, respiratory system, kidney and liver. Effects of exposure range from light-headedness to unconsciousness and death. Symptoms of overexposure include nausea, vomiting, loss of appetite and weight, weakness, eye, nose and throat irritation, and numbness in the limbs. Direct prolonged or repeated skin contact with solvents can result in dermatitis. Dermatitis causes extreme dryness of the skin and can cause fissuring, which can increase a worker's susceptibility to infection. Exposure can also cause skin, eye, throat, and mucus membrane irritation.

However, the above symptoms and effects occur only with high exposure to very concentrated sources of the chemical material. The SEPs contain only low concentrations of chemical compounds resulting in a relatively low risk from exposure to the SEP water or sludge. It is unlikely that workers would intentionally ingest SEP materials, and personal protective equipment (PPE) and administrative procedures should prevent incidental ingestion and inhalation. Engineering and administrative controls (i.e. splash guards, ventilation, work practices) are implemented first to maintain low exposure. When engineering or administrative controls are not feasible or sufficient, PPE use is implemented. Also, the PPE should protect workers from adverse (chronic) effects due to low exposures over a prolonged period of time. Overall, the health risk from exposure to chemical compounds is minuscule due to the low chemical levels present in the SEPs and the PPE and procedures that are used in the SEPs area.

The metal contaminants contained in the SEPs are potentially toxic if inhaled or swallowed in sufficient quantities. Exposures above the permissible exposure limits (see attached data sheets) could contribute to a variety of health disorders including neurological damage, kidney damage, blood disorders, birth defects, and cancer. The amounts of these metals in the product are low (see Section 3.2).

As an assessment of the health risks posed by metals contamination, an estimate was developed to project total respirable dust intake to PELs of known metals contaminants. Beryllium was chosen as the target compound since its PEL (0.002 mg/m^3) is the lowest of all known contaminants at the site. Analytical data from the May, 1991 samples indicated that the highest beryllium concentration found was roughly 18 mg/kg in SEP 207C sludge. One can use this concentration in sludge to calculate the amount of airborne particulate to reach the beryllium exposure limit.

Given that Beryllium concentration in sludge = 18 mg/kg, and
• Beryllium PEL = 0.002 mg/m^3, then the fractional part of beryllium in sludge is:

$$\frac{18 \text{ mg Be}}{10E6 \text{mg sludge}} = 1.8E-5$$

and the PEL dust equivalent in air is:

$$\frac{0.002 \text{ mg/m}^3}{1.8E-5} = 111 \text{ mg/m}^3.$$

Based on this information the air concentration of dusts would need to exceed 111 mg/m^3 before the target PEL could be realized. Reaching a concentration of 111 mg/m^3 of sludge in air is virtually impossible. Dusts at this concentration would nearly prevent visibility and thus alert personnel to the problem.

Also, reaching this extraordinarily high particulate level in air is even more unlikely considering that the laboratory analysis for beryllium is for dry sludge. If an assumption is made that pondsludge contains 40% solids and the remainder is water (based on 1985 and 1986 sampling results), then it would take (111 mg/m^3) x 1.40 = 155 mg/m^3 total airborne concentration to reach the beryllium PEL. It is also highly unlikely that a <u>wet</u> sludge would produce significant airborne particulate levels. It is not expected that concentrations of metals will exceed the PELs.

3.2.3 HEALTH HAZARDS OF PRIMARY CONTAMINANTS

Detailed information on select toxic metals, organic, and inorganic compounds that are known to be present in solar pond water and sludge is presented in APPENDIX A. This information was retrieved from the National Library of Medicine Hazardous Substances Data Base, and is presented in the following format.

- Name
- CAS Number
- Molecular Formula
- Chemical & Physical Properties
- Hazards Summary
- Health Effects
- Radiation Limits and Potential
- Occupational Regulations and Standards

Health hazards of primary contaminants:

METALS:
Americium
Arsenic
Cadmium
Chromium
Lead
Nickel
Plutonium
Silver
Uranium

ORGANICS AND INORGANICS:
2-Butanone (Methyl Ethyl Ketone)
Hydrogen Cyanide (for Total Cyanides)
Tetrachloroethylene (Tetrachloroethene) or (PCE)

3.3 RADIOLOGICAL HAZARDS

3.3.1 IDENTIFICATION OF RADIOACTIVE WASTE FORMS

Radiological hazards associated with the SEP operations were assessed by reviewing radiochemical analyses on samples collected for Weston in May 1991 and for HNUS in summer and fall, 1991. The detected radionuclides are listed in the following tables.

Radioactivity has been detected in water and sludge from all SEP's, and the clarifier (see Tables 3.3-1 to 3.3-5).

3.3.2 HAZARD ASSESSMENT OF SEP RADIOACTIVE MATERIALS

The risks associated with overexposure to ionizing radiation vary with the effective dose which is defined by the type of radiation. Uncontrolled, chronic (low level, long term) exposure to ionizing radiation may contribute to an increased risk of cancer and genetic effects in offspring. Relatively high chronic levels of radiation exposure may increase the risk of birth defects. Acute (high, short term) exposures from handling of SEP material is not a significant hazard at the site. Most likely, radiation exposure levels slightly above background could occur at the site.

There are two primary sources of potential radiological exposure identified at the SEP Site: (1) internal exposure from alpha emissions, and (2) external exposure from gamma, X-ray, and high energy beta emissions. The identified radionuclides and their respective concentrations could result in an increase above natural external background radiation levels. However, such increases in radiation exposure levels have not been identified from Pondcrete and Saltcrete Remix and Storage at the 750 and 904 Pads. The primary potential hazard identified is internal radiation exposures, as described in the following discussion.

To demonstrate the hazard, the concentrations of identified radionuclides in the SEP water are compared to the Derived Concentration Guide Standards (DCG). The DCGs are standards established to keep exposures to the General Public below 100 mrem/year from drinking water. The gross alpha, gross beta, and specific isotopes identified from the SEPs exceed the set DCG drinking water standards. Although these drinking water standards are considerably less than SEP analyses, equivalent exposure to workers is unlikely. Administrative controls do not permit workers to eat or drink in the Process and SEP area, preventing ingestion of contaminated water or other materials.

The primary exposure identified from the SEP material is from inhalation. Table 3.3-6 lists airborne concentration limits for radionuclides called Derived Air Concentrations (DAC). DOE Order 5480.11 (9)g(3)a, directs that ambient air monitoring is to be performed in occupied areas with the potential to exceed 10% of any DAC. Proposed regulatory requirements in 10 CFR 835 (12/9/91) require real time monitoring wherever airborne radioactivity exceeds 10% of the DAC; but allows air sampling pumps with filters to be used initially to determine if the environment has over 10% DAC.

Resuspension of radioactive materials in sludge and pond water may present a potential airborne radioactivity exposure risk. This would be caused by mechanical mixing or drying of SEP material. Previously conducted remix operations of pondcrete at the 904 Pad has supported the contention that resuspension of the SEP material can lead to airborne concentration levels exceeding 10% DAC. For this reason, engineering and work control measures are utilized to prevent drying and resuspension of the SEP material. Low volume air sampling will continue to be conducted for the SEP Processing Project to determine the potential level of airborne contaminants.

The potential for airborne contamination is directly related to environmental conditions and radioactivity concentrations in the SEP material. Care should be taken to minimize the drying and resuspension of the SEP material. Once again, this can be accomplished through engineering and work controls.

3.3.3 POTENTIAL AND MANAGEMENT OF EXPOSURE TO RADIOACTIVE MATERIALS

The potential for radioactive contamination exposure exists for SEP operations which includes:

- Reclaiming, pumping, and filling process vessels and piping with SEP contents during mixing and transfer operations,
- Re-entrainment of dried sludge dust from ponds, equipment, and pads, waste containers, etc.
- Spills and leaks of SEP materials from process equipment,
- Removal of materials from the trash box,
- Collecting samples from process equipment,
- Manual removal of large objects from the SEP,
- Maintenance and/or repair operations on process equipment,
- Decontamination of workers or equipment, and
- Improper use of, or inappropriate, personal protective equipment.

Administrative procedures, air monitoring, engineering controls, and personnel protective clothing (PPE), will limit worker exposure to radioactive materials. The EG&G Rocky Flats Waste

Management Department has designated the entire area as a treatment and storage facility, accessible only to authorized personnel. Signs indicate the SEP site to be a "Restricted Area". Workers are not permitted to eat or drink in the process area which will aid in preventing ingestion of contaminated water or other materials. EG&G Radiological Protection staff will monitor for airborne radioactivity to advise HNUS of any special situations requiring additional engineering or personal protection equipment precautions. Note that EG&G has adopted the DOE (U.S. Department of Energy) ALARA guidelines for the RFP. ALARA is a policy requiring all radiation exposure to be reduced to levels "As low as reasonably achievable". A combination of engineering and administrative controls and PPE, when necessary, are used to maintain ALARA.

TABLE 3.3-1

RADIONUCLIDES IN 207A SOLAR POND WATER AND SLUDGE

I. WATER

		Weston (1)	HNUS (2)
Americium 241	pCi/L	0.42 +- .19	--
Gross Alpha	pCi/L	300. +- 60	610-790 (2)
Gross Beta	pCi/L	930. +- 60	1000 (2)
Plutonium 239	pCi/L	0.71 +- 0.29	--
Uranium 234	pCi/L	310. +- 10	--
Uranium 235	pCi/L	11. +- 1	--
Uranium 238	pCi/L	340. +- 10	--

II. SLUDGE

		Weston (1)	HNUS (2)
GROSS ALPHA	pCi/g	5100 +- 500	570 (2)
GROSS BETA	pCi/g	1400 +- 100	95 (2)

(1) Source: List of Reports - Data Summary for Solar Evaporation Ponds
Solar Pond Final Report, EG&G Rocky Flats Plant, Inc.

(2) Deliverable (combined) 224A and 224E
POND SLUDGE AND CLARIFIER SLUDGE
WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992

TABLE 3.3-2

RADIONUCLIDES FOUND IN 207B SERIES SOLAR PONDS WATER AND SLUDGE

I. WATER (1)

		207B-N	207B-C	207B-S
AMERICIUM 241	pCI/L	0.14 +-.11	5.50 +-4.5	0.13 +-.11
GROSS ALPHA	pCI/L	59.00 +-21 40-52 (2)	2400.00 +-300 1800-2300 (2)	1600.00 +-200 1500-2100 (2)
GROSS BETA	pCI/L	110.00 +-20 75-510 (2)	3900.00 +-200 2700-3000 (2)	2300.00 +-200 2500-2900 (2)
PLUTONIUM 239	pCI/L	0.00 <0.1	0.36 +-.18	0.14 +-.12
URANIUM 234	pCI/L	40.00 +-2.	780.00 +-30	760.00 +-50.
URANIUM 235	pCI/L	1.70 +-.5	36.00 +-7	31.00 +-11.
URANIUM 238	pCI/L	26.00 +-2.	900.00 +-40	870.00 +-60.

II. COMPOSITE SLUDGE (1)

		207B-N	207B-C	207B-S
AMERICIUM 241	pCI/g	0.00 <1.0	0.00 <1.0	2.40 +-.9
GROSS ALPHA	pCI/g pCi/g	33.00 5.2 - 11 (2)	120.00 +-30 13-19 (2)	150.00 +-40 31-61 (2)
GROSS BETA	pCI/g pCi/g	46.00 +-3 5.1-9.8 (2)	380.00 +-50 12-16 (2)	530.00 +-50 21-47 (2)
PLUTONIUM 239	pCI/g	2.20 +-1.1	5.10 +-1.6	1.90 +-.5
URANIUM 234	pCI/g	13.00 +-1	70.00 +-2	130.00 +-10
URANIUM 235	pCI/g	0.41 +-.13	2.50 +-.4	2.90 +-2.2
URANIUM 238	pCI/g	8.40 +-0.6	75.00 +-2.0	150.00 +-20

(1) Source: List of Reports - Data Summary for Solar Evaporation Ponds
Solar Pond Final Report, EG&G Rocky Flats Plant, Inc.

(2) Deliverable (combined) 224A and 224E
POND SLUDGE AND CLARIFIER SLUDGE
WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992

TABLE 3.3-3
RADIONUCLIDES IN 207C SOLAR POND WATER AND SLUDGE

I. WATER (1)

AMERICIUM 241	pCI/L	8.60 +-.6
GROSS ALPHA	pCI/L	72000.000 +-8000 63,000-130,000 (2)
GROSS BETA	pCI/L	170000.00 +-10000 170,000-230,000 (2)
PLUTONIUM 239	pCI/L	670.00 +-20.
URANIUM 234	pCI/L	2600.00 +-100
URANIUM 235	pCI/L	120.00 +-30.
URANIUM 238	pCI/L	3900.00 +-200

II. COMPOSITE SLUDGE (1)

AMERICIUM 241	pCI/g	1.70 +-0.1
GROSS ALPHA	pCI/g pCi/g	18.00 +-4 2700-8700 (2)
GROSS BETA	pCI/g pCi/g	420.00 +-10. 420-1200 (2)
PLUTONIUM 239	pCI/g	15.00 +-8.
URANIUM 234	pCI/g	5.20 +-0.6
URANIUM 235	pCI/g	0.84 +-.25
URANIUM 238	pCI/g	31.00 +-1.

(1) Source: List of Reports - Data Summary for Solar Evaporation Ponds
Solar Pond Final Report, EG&G Rocky Flats Plant, Inc.

(2) Deliverable (combined) 224A and 224E
POND SLUDGE AND CLARIFIER SLUDGE
WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992

TABLE 3.3-4
RADIONUCLIDES IN CLARIFIER WATER AND SLUDGE

I. WATER (2)

GROSS ALPHA	pCi/L	16,000-19,000
GROSS BETA	pCi/L	22,000-30,000

II. SLUDGE (2)

GROSS ALPHA	pCi/g	3400-6600
GROSS BETA	pCi/g	540-860

(1) Source: List of Reports - Data Summary for Solar Evaporation Ponds Solar Pond Final Report, EG&G Rocky Flats Plant, Inc.

(2) Deliverable (combined) 224A and 224E
POND SLUDGE AND CLARIFIER SLUDGE
WASTE CHARACTERIZATION REPORT, prepared for EG&G Rocky Flats by Halliburton NUS Environmental Corporation, January 1992

TABLE 3.3-5
WATER STANDARDS FOR RADIONUCLIDES

	DCG, pCi/L	MCL
AMERICIUM 241	30	--
GROSS ALPHA	--	15 pCi/L
GROSS BETA	--	4 mrem/yr, (a previous MCL for beta was 50 pCi/L)
PLUTONIUM 239	30	--
URANIUM 234	500	20 pCi/L (proposed for total Uranium)
URANIUM 235	500	--
URANIUM 238	500	--

DCG = Derived Concentration Guide for ingested water to prevent exposure of the public to radionuclides effective dose equivalent in excess of 100 mrem/year per DOE 5400.5.

MCL = Maximum Contaminant Level in drinking water set by U.S. EPA to prevent adverse health effects with a lifetime of consumption of water below the MCL.

TABLE 3.3-6
AIRBORNE EXPOSURE LIMITS FOR RADIONUCLIDES IN SEPs

	DAC Exposure Limits, pCi/L
AMERICIUM 241	0.002
PLUTONIUM 239	0.002
URANIUM 233,234,238	0.02

DAC = Derived Air Concentrations for limiting radiation exposures through inhalation of radionuclides by workers as established in DOE 5480.11.

Per DOE 5480.11, the lowest DAC for each of the radionuclides in uCi/mL is as follows:

AM 241: 2E-12
PU 239: 2E-12
U233, 234, 238: 2E-11. Using a conversion of E9 yields results in pCi/L. (1 uCi/mL x E6 pCi/uCi x E3 mL/L = E9 pCi/L)

3.4 PHYSICAL AND NATURALLY OCCURRING STRESSES

Heat, rain, cold, snow, ice, wind, hail, and lightning are natural phenomena which complicate work activities and increase risk. Much of the responsibility for protection from inclement weather hazards falls upon the HNUS Safety and Health Supervisor, the EG&G Health and Safety Coordinator, HNUS Operations and Maintenance Supervisor, the EG&G Waste Operations Managers, and the EG&G Operational Meteorologist. These persons must be aware of how inclement weather hazards may affect safety at the processing site, and determine appropriate actions at the site when inclement weather occurs. In particular, site personnel should evaluate weather conditions that affect instrument and PPE functions and constantly remind site workers of the effects and need for more careful attention to check-out, donning and doffing of PPE, and monitoring of function and integrity. Site management must make decisions on the proper safety procedures to use if work must continue, or to stop work if the risk is too great.

3.4.1 COLD STRESS

The potential for cold stress is a particular concern when field activities are performed while air temperatures at the site are below 40° F. If winds are blowing at 5 mph or greater and/or the weather is damp or wet, cold stress is even more of a potential hazard. Precautions that will be taken to prevent cold stress include wearing cold-protective clothing appropriate for the level of cold and physical activity, changing clothing if it becomes wet, and the establishing a work/warming regiment. Cold-protective clothing will include layering of garments and use of gloves and hats. The warming breaks should be taken in a warm location, i.e. the 788 Building, 750 Pad Trailer, or other designated location. During warming breaks taken in the site support zone, warm, sweet beverages and hot soups should be consumed to provide calories and fluids. Drinking coffee or other caffinated beverages is not recommended.

Cold stress, if not prevented, can result in frostbite and hypothermia. Ignoring the signs and symptoms can be life-threatening. Prevention is the key. As a preventative measure, body core temperature must not drop below 96.8° F. Pain in the extremities is the first early warning of cold stress. Severe shivering sets in when body core temperature has dropped to 95° F. If this occurs, work will stop immediately and the affected workers(s) will take a warming break of sufficient duration until the cold stress signs and symptoms are gone. Additional signs of cold stress include deterioration of physical coordination, slurred speech, and faulty judgment. Table 3-9 lists additional symptoms of cold exposure.

TABLE 3-9
SYMPTOMS OF COLD EXPOSURE

CONDITIONS	SYMPTOMS
Frost Nip or Incipient Frostbite	Sudden blanching or whitening of the skin
Superficial Frostbite	Skin becomes waxy or white and superficially firm, but resilient beneath
Deep Frostbite	Cold, pale, solid skin tissues
Systemic Hypothermia	Caused by exposure to freezing or rapidly dropping temperature. Symptoms are progressive and may include shivering, apathy, listlessness, sleepiness, and rapid cooling of the body temperature to less than 95° F; unconsciousness, glassy stare, slow pulse and slow respiratory rate; freezing of the extremities; and death.

3.4.2 HEAT STRESS

A worker's risk for developing heat stress is greatly increased when wearing impermeable clothing. This type of clothing, which is anticipated to be worn, limits the body's normal heat exchange mechanisms and increases energy expenditure. Heat stress can cause health effects which range from heat fatigue to serious illness or death. Signs and symptoms of heat stress are listed in Table 3-10.

An initial work/rest regimen for the prevention of heat stress has been developed by EG&G Industrial Hygiene. The plan allows workers to spend no more than 90 minutes while equipped with anti-C PPE. A minimum 15 minute rest period is also mandatory for the same personnel. This regime will be altered as needed to protect worker's health using guidelines of Tables 3-11 and 3-12. Ambient temperature, humidity, and the worker's heart rate, core temperature, and weight loss will contribute to the decision to alter work practices. In addition, any worker experiencing heat stress is instructed to immediately stop work and notify a supervisor and remove any PPE. Heat stress monitoring will be performed as detailed in Table 3-11.

TABLE 3-10
SYMPTOMS OF HEAT STRESS

CONDITIONS	CAUSES/SYMPTOMS
Heat Rash	Results from continuous exposure to heat or humid air; skin develops red rash.
Heat Cramps	Caused by heavy sweating with inadequate electrolyte replacement. Symptoms include muscle spasms, pain in hands, feet or abdomen.
Heat Exhaustion	Occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; or fainting.
Heat Stroke	The most serious form of heat stress. The body's temperature regulation fails and core temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms include red, hot, usually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse; or coma.

TABLE 3-11
GUIDELINES FOR PREVENTION OF HEAT STRESS
BY
MONITORING HEART (PULSE) RATE

1. The worker will initially determine his/her resting HR prior to starting work activities.

2. At the start of the first rest period, the worker will determine his/her HR. This initial HR should not exceed the individual's age-adjusted maximum HR (see table of age versus maximum heart rate below), which equals [0.7)(220 - age in years)]. At one minute into the rest period the recovery HR will be determined. The recovery HR should not exceed 100 beats per minute.

3. If the initial HR exceeds the age-adjusted maximum HR, or the one-minute recovery HR is greater than 110 beats per minute, then the next work period will be decreased by one-third.

AGE	MAXIMUM HEART RATE(MHR)	AGE	MHR	AGE	MHR
20	140	35	130	50	119
21	139	36	129	51	118
22	139	37	128	52	118
23	138	38	127	53	117
24	137	39	127	54	116
25	137	40	126	55	115
26	136	41	125	56	115
27	135	42	125	57	114
28	134	43	124	58	113
29	134	44	123	59	113
30	133	45	122	60	112
31	132	46	122	61	111
32	132	47	121	62	111
33	131	48	120	63	110
34	130	49	120	64	109

TABLE 3-12
GUIDELINES FOR PREVENTION OF HEAT STRESS THROUGH WATER INTAKE

1. The sense of thirst is not an adequate regulator of water replacement needs during heat exposure. Therefore, water must be replaced at prescribed intervals. Water or other flavored drinks will be provided in the break location.

   a. Before work begins, drink two eight-ounce glasses of water.

   b. During each rest period, drink at least two eight-ounce glasses of water.

2. An adequate supply of potable water and drinking cups will be readily available, such as in a support vehicle in the support zone, to provide water during rest periods.

   Recommended drinks are:

   a. Plain water, served cool

   b. Juice, diluted 3:1 with water

   c. Electrolyte solutions, such as Gatorade, diluted 3:1 with water.

3. Adding salt to water is not recommended. Do not use salt tablets! Also avoid the following:

   a. Alcoholic beverages

   b. Caffinated beverages (e.g. coffee and tea)

   c. Concentrated juices

   d. Water with salt added.

3.4.3 LIGHTNING

Lightning represents a hazard of electric shock which is increased when working in flat open-spaced, elevated work places, and working near tall structures or equipment. Work will be stopped in open areas, when working on or in water, and in elevated work places when lightning strikes are sighted or thunder is heard near a work site.

3.4.4 HIGH WINDS

High winds generate two types of hazards to field personnel. High winds carry spray from the surface of the solar ponds and deposit the spray on the berms and surrounding areas. High winds can re-suspend dust contaminated with metals and radionuclides. Outdoor sludge handling and sampling activities will be curtailed when sustained wind speeds equal or exceed fifteen (15) miles per hour. At 25 mph sustained wind speed, truck doors on the tents must be shut and secured; at 35, outdoor work will cease; and at 45, tents will be evacuated. The EG&G meteorologist will maintain surveillance regarding adverse weather conditions and will maintain a liaison with HNUS on-site operations personnel to report adverse weather conditions.

Extremely high winds, the Chinook Winds that can exceed 100 miles per hour, occasionally occur at RFP and can create hazards due to blowing debris, or by wind damage to structures.

3.4.5 BIOLOGICAL HAZARD

The potential biological hazards include: ticks, spiders, wasps, and rattlesnakes.

3.4.6 SOLAR RADIATION

According to the National Cancer Institute, solar radiation is the chief cause of nonmelanoma skin cancer and is responsible for about 90 percent of cases. It has also been linked with skin melanoma, but that relationship is more complex.

Though nonmelanoma skin cancers are now considered to be 98 percent curable, they have accounted for many deaths in the United States. More than 400,000 new cases of nonmelanoma skin cancer are thought to occur in the United States each year, and this number is rising. Nonmelanoma skin cancer is the most common form of cancer among Caucasians.

The relationship between sun exposure and nonmelanoma skin cancer has been clarified greatly in the past decade. Time of day and time of year affect the amount of solar radiation in any location. The greatest amount, of course, occurs during the summer months, and a third of the day's total amount occurs between the hours of 11 a.m. and 1 p.m. (or 12 noon and 2 p.m. DST). Altitude and sky cover are also important factors. The incidence of nonmelanoma skin cancer varies directly with exposure to ultraviolet (UV) light from the sun and indirectly with the degree of skin pigmentation. Thus, nonmelanoma skin cancer is most common among fair-skinned whites who live in sunny locales.

This is particularly important in Colorado with its high altitude, large number of sunny days, and the numerous outdoor activities. Workers who are outdoors should wear hats or caps to shade the face from sun. Long-sleeved shirts and sunscreens (with a sun protection factor of at least 30) should be utilized to limit solar exposure.

3.5 NOISE EXPOSURE

Workers may be exposed to noise while working at the SEP site in the vicinity of forklifts, mixers, pumps, air hammers and other noise sources. Noise exposure should be controlled to levels below those stipulated in Table 3-13 or adequate hearing protection shall be required of all exposed personnel. Noise monitoring will be performed as detailed in Chapter 10.

TABLE 3-13
THRESHOLD LIMIT VALUES FOR NOISE

DURATION PER DAY HOURS	SOUND LEVEL dBA*
16	80
8	85
4	90
2	95
1	100
1/2	105
1/4	110
1/8	115**

*Sound level in decibels are measured on a sound meter, conforming as a minimum to the requirements of the American National Standards Specification for Sound Level Meters, S1.4 (1971 Type S2A, and set to use the A-weighted network with slow meter response).

**No exposure to continuous or intermittent noise in excess of 115 dBA.

3.6 MECHANICAL HAZARDS

Potential mechanical hazards in the operations may include falling or dropped tools and piping; forklift and crane operation; pinch points at the cement mixer and trashscreen; rotary mixing arms on the thickener/clarifier; shock hazards from electrical motors; air compressor operations; unloading equipment and materials from trailers; material handling of chemical supplies; and tripping and falling hazards around the ponds and from high work stations. The guidelines for these hazards and their methods of hazard control are to be detailed in the operations manuals, Operational Safety Analysis (OSA) or Job Safety Analysis (JSA) for the worksite. As specific operations and processes, and job tasks are developed, the hazards relative to health and safety protocols will be assessed and appropriate OSA and JSA prepared.

The OSA is to be prepared whenever there is risk of serious injury, exposure to toxic or radioactive materials, etc. The difference is that a JSA is to be prepared for non-routine, or one-time operations involving hazardous work or exposure.

3.7 RISK ASSESSMENT

Health and Safety risks at the SEP site will be minimized by a combination of several factors. These preventive measures include standard operating procedures, personnel training, monitoring equipment and alarms, engineering controls, personal protective equipment, and mechanical safeguards.

Chemical hazards and risks will be minimized through the analysis and evaluation of chemical compounds present at the site. Based on the collected information, the appropriate engineering, administrative, and PPE safeguards are utilized. At a minimum, this includes the selection and use of appropriate PPE and establishing training programs to inform personnel working in the area of the contaminants, hazards, and proper methods of handling the materials. Additional safeguards may include the use of exclusion zones, contamination reduction zones, real-time monitors, personal air monitoring equipment, engineering controls, and spill prevention techniques.

Radiological hazards and risks are minimized similarly to chemical hazards. The materials have been analyzed and the appropriate measures determined for the proper management and handling procedures. Real-time monitoring, radiation surveys, engineering controls, and PPE are utilized to minimize risk. Additional safeguards include available personnel training programs, use of exclusion/contamination reduction zones, use of decontamination facilities and procedures, as well as spill prevention techniques.

Mechanical hazards and risks will be minimized primarily through the use of engineering controls and fail-safe equipment. Specific operating procedures shall be written and followed during operations at the site. EG&G will write applicable OSA and JSA for SEP clean-up by HNUS.

Physical stresses and their related risks can be minimized in several ways depending on the specific situation. Heat stress and cold exposure will be minimized by established work/rest regimes, clothing guidelines, monitoring and training programs, and engineering controls (heat, shelter). Noise exposure will be minimized by sound surveys of work areas and the use of hearing protection equipment when necessary.

3.8 HAZARDS BY WORK ACTIVITY AND JOB DESCRIPTION

This section describes the potential hazards that may occur for generalized work activities associated with Solar Ponds remediation. Table 3-14 identifies the work activities and associated hazards that are generally involved in Solar Ponds remediation site work, and safety measures available to prevent harmful situations from occurring. Table 3-15 identifies specific job descriptions involved in the Solar Ponds remediation, and the potential hazards, and safety measures associated with that particular job.

TABLE 3-14
DESCRIPTION OF HAZARDS BY WORK ACTIVITY FOR SOLAR PONDS OPERATIONS

ITEM	WORK ACTIVITY	HAZARDS	SAFETY MEASURE
A.	Reclaiming, pumping,pouring, sampling, or processing pond water or sludge, and operations and maintenance of the process equipment.	Radioactive & chemical skin exposures from: leaks; spills; removal of materials from the trash box; collection of samples; spontaneous repair and maintenance; improper decontamination efforts.	Personnel must receive Rad Worker Training. Protective clothing per Rad Work Permit and HASP. Personnel must know hazard description of area from HASP. RPTs survey work areas and monitor workers. Decontamination of work areas exceeding 20 dpm removable alpha activity, 300 dpm fixed alpha. Posting of Radiological Controlled Areas (RCA) Refer to MSDS maintained at the project site.
		Radioactive and chemical inhalation.	Personnel must receive Rad Worker Training. Protective clothing per Rad Work Permit and HASP. Personnel must know hazard description of area from HASP. RPTs survey work areas and monitor workers. Respirators per Rad Work Permit and HASP equipment.
		Penetrating radiation exposure	Low level activity in pond materials. Dosimetry badge.
		Ingestion of radioactive and chemical contaminants.	No eating, smoking, drinking chewing, make-up in process areas; these activities only allowed in approved areas. Good personal hygiene practices including washing hand and face during breaks and before eating, and showering after work shift.
B.	Work on Pond Berms	Slipping, falling into ponds.	Personnel must be secured with a safety line attached to a fixed object.
C.	Work involving usage of PPE for eye, facial, head, foot, skin, hearing, radiological, or chemical protection.	Improper use of PPE.	Personnel receive OSHA training for hazardous waste site work. Personnel receive Rad Worker training. Surveillance by supervision.

ITEM	WORK ACTIVITY	HAZARDS	SAFETY MEASURE
		Splashes & foreign bodies in eyes.	Safety glasses or goggles must be worn.
D.	Operations and maintenance of process equipment and hand tools.	Pinch points, rotating parts on equipment.	Rotating equipment must be covered with machine guards per OSHA. Improperly guarded equipment will not be allowed to operate per supervision. Workers must report unguarded equipment to supervisor.
		Electrical hazards from equipment.	Unauthorized personnel are not to attempt repairs or connection of electrical equipment. Only qualified electricians are to work on electrical equipment.
		Excessive noise.	Wear hearing protection as specified in HASP. Monitoring of noise levels. Posting of high noise areas.
		Handtool cuts, punctures, blows, shocks.	Wear proper gloves to prevent hand injury. Plan handtool activity in advance to ensure personnel and objects will not interfere with tool usage. Keep tools in good repair. Do not use damaged equipment. Use tools only for intended purpose. Do not use power tools with damaged cords or housing. Check for grounding prong, housing cracks, frayed or nicked cords, blade or other guards, and safe handles. Do not use power tools where moisture may cause a shock hazard. Check tools for proper grounding plugs and insulation. Use ground fault circuit interrupters on all electrical power cords and electrical tools.

ITEM	WORK ACTIVITY	HAZARDS	SAFETY MEASURE
E.	Materials handling.	Crushing by equipment and materials.	Personnel must have OSHA health & safety training. Keep a safe distance away from moving equipment. Always be aware of the swing radius of equipment. Do not stand within the swing radius of equipment. Provide barricades to keep non-essential personnel out. Wear safety shoes and hard hat while in area. Do not stand under equipment or materials being moved. Use proper equipment for the job. Do not use damaged slings or other lifting devices. Keep unauthorized personnel away from half-crate transportation operations. Do not get in front of moving half- crates. Secure half-crates before pouring, sampling, sealing, monitoring, or tagging.
		Working with or near heavy vehicles.	Only vehicles absolutely necessary will be allowed in the work area. Seat belts must be worn by personnel in an operating vehicle. Follow speed limits. Construction vehicles must have back-up warning devices. Periodic hoisting equipment inspection and records must be current with crane. Hoisting and rigging equipment must be inspected by EG&G Safety prior to use. Areas of crane and heavy vehicle use must be cleared and marked, and non-essential personnel removed. Tag lines must be used to control loads. Only qualified personnel can operate equipment. A person shall be designated to perform signalling. Cranes and other elevated equipment are not to operate in the vicinity of overhead power lines. No work is to occur within 10' of energized systems unless approved by supervision. Keep travel paths clear of people, tools, and materials to avoid collisions.

ITEM	WORK ACTIVITY	HAZARDS	SAFETY MEASURE
F.	General site operations, maintenance, inspection, or site visitation.	Trips, falls, slipping, and bumps into solid objects.	Personnel must have OSHA health & safety training. Maintain good housekeeping--keep work area clear of debris, loose pipes, tools,spare equipment--keep materials in designated locations. Stack materials neatly to prevent obstacles. Maintain vehicle access/fire lanes.
		Flying (windborne) and falling objects.	Wear hard hats. Barricade or post areas subject to falling objects. Keep non-essential personnel out and secure materials. Evacuate process areas for designated safe locations when high wind warnings are issued.
		Cold stress inc. Frostbite & hypothermia, and ice.	Follow guidelines in HASP. Wear proper clothing. Monitor each other's exposed skin for signs of frostbite. Drink warm, non-caffeine beverages at breaks. Keep work areas free of ice accumulations. Use melting and traction agents as needed.
		Heat stress and excess sun.	Follow guidelines in HASP. Drink non-caffeine beverages at breaks. Follow field recommendations from Industrial Hygiene. Wear hat, long sleeves, and use sunscreens.
		Lightening, wind.	Evacuate process areas for designated safe locations when lightening or high wind warnings are issued.
		Insects, ticks, snakes.	Watch where you step. Use insect repellant. Keep work area clear of debris and vegetation.
		Improper use of ladders	Each user must visually inspect each ladder for defects before use. Use both hands to scale ladder. Don't carry materials with hands.Use handline to raise & lower materials. Securely tie off ladders. Do not extend the waist beyond or above the ladder rungs.

ITEM	WORK ACTIVITY	HAZARDS	SAFETY MEASURE
		Improper lifting	Get help for lifting heavy or awkward loads. Plan where the load will be put before lifting the object. Push or pull instead of lifting whenever possible. Make sure footing is secure and not slippery. Secure parts (in a box) before lifting to prevent shifting. Lift with legs, and not back. Keep the back straight. Avoid sudden jerks, sudden pulls, and twisting from the waist.
		Injuries related to personal conduct.	Horseplay, fighting, gambling, explosives, possession or improper use of firearms, alcoholic beverages, drugs, is prohibited. Theft, vandalism, sabotage, and distribution of unauthorized literature will result in disciplinary action.

TABLE 3-15
DESCRIPTION OF HAZARDS BY JOB DESCRIPTION FOR SOLAR PONDS OPERATIONS

WORK LOCATION	JOB DESCRIPTION	HAZARDS	SAFETY MEASURE
ALL OF 207/750 Area	Operations/Maintenance Supervisor	See Hazards A, B, C, D, E, on Table 3-14.	See Safety Measures A, B, C, D, E on Table 3-14.
ALL OF 207/750 Area	Process Shift Supervisor	See Hazards A, B, C, D, E, on Table 3-14.	See Safety Measures A, B, C, D, E on Table 3-14.
All of 207/750 Area	Start-up Engineer	Similar to Operations Support Manager.	See Safety Measures A, B, C, D, E on Table 3-14.
All of 207/750 Area	QA/QC Technician	Similar to Operations Support Manager, but overall hazard potential is reduced since this position will involve less direct work with equipment and materials than operator positions.	See Safety Measures A. B, C, D, E, on Table 3-14.
All of 207/750 Area	Industrial Hygiene Representative and Radiological Protection Technician	Similar to QA/QC Tech hazards.	See Safety Measures A, B, C, D, E on Table 3-14.
All of 207/750 Area	Instrument Technician	Similar to Operations Support Manager hazards. Electrician/Instrument Techs may have increased potential for electrical shocks; also more contact with pond materials when repairing and maintaining equipment.	See Safety Measures A, B, C, D, E on Table 3-14.
All of 207/750 Area	Maintenance Mechanic	Similar to Operations Support Manager hazards; however, more potential for exposure to pond materials, shock, and mechanical/physical hazards due to more hands-on work. May also include hazards from cleaning solvents, and welding/cutting fumes, bottled gases, or high voltage.	See Safety Measures A, B, C, D, E on Table 3-14.

WORK LOCATION	JOB DESCRIPTION	HAZARDS	SAFETY MEASURE
Ponds & Disinfection Areas	Pond Dredging & Pumping Operators	See Hazards A, B, C, D, E on Table 3-14. Increased potential to physical hazards while positioning dredging head in ponds including slipping into the ponds. Inhalation, skin, and eye exposure to calcium hypochlorite used for disinfection.	See Safety Measures A, B, C, D, E on Table 3-14. Personnel must receive specific safety training on using calcium hypochlorite. Personnel must wear PPE including protective clothing, eye and face protection, protective gloves, and respirator (when dumping the chemical).
Clarifier	Clarifier Reclaim Operators	See Hazards A, B, C, D, E on Table 3-14. Falls from elevated equipment. Increased potential to physical hazards while positioning dredging head in ponds including slipping into the ponds. Inhalation, skin, and eye exposure to calcium hypochlorite used for disinfection.	See Safety Measures A, B, C, D, E on Table 3-14. Hand rails along clarifier steps and platform. Body harness or other fall restraint if elevated work becomes necessary outside the hand rail area. Personnel must receive specific safety training on using calcium hypochlorite. Personnel must wear PPE including protective clothing, eye and face protection, protective gloves, and respirator (when dumping the chemical).
Batch Mixing Area	Mixing Station Operators	See Hazards A, B, C, D, E on Table 3-14.	See Safety Measures A, B, C, D, E on Table 3-14.
Cementing	Cement Equipment Operator	See Hazards A, B, C, D, E on Table 3-14. Burns from cement, flyash, lime.	See Safety Measures A, B, C, D, E on Table 3-14. Wear long sleeves, long pants, and socks. Keep clothing fully buttoned or zipped. Use protective gloves when handling. If necessary to walk in concrete, use rubber boots. Wear appropriate eye and face protection. Know location of emergency showers and eye washes.

WORK LOCATION	JOB DESCRIPTION	HAZARDS	SAFETY MEASURE
Pozzolan Staging & Mixing Area	Bulk Material Equipment Operators	See Hazards A, B, C, D, E on Table 3-14.	See Safety Measures A, B, C, D, E on Table 3-14.
Trash Screen/Box Disposal	EG&G Chemical Operator	See Hazards A, B, C, D, E on Table 3-14.	See Safety Measures A, B, C, D, E on Table 3-14.
Casting Station	Casting Station Operator	Similar to Cement Equipment Operator Hazards.	Similar to Cement Equipment Operator Safety Measures.
Casting Station	EG&G Chemical Operators--Casting	Similar to Casting Station Operator. Splashing of cement waste form during filling of half-crates. Crushing and pinching during transport, sealing, and inspections of half-crates.	Similar to Casting Station Operator Safety Measures. May also need some additional safety measure instruction in half-crate quality assurance measures, and transport; and gluing, sealing, and stapling half-crates.
Pond Walls Washdown/Clean-Out	EG&G Chemical Operator	Similar to Dredging & Pumping Operator hazards (above), but less likely to be working with heavy equipment, or around deep water.	Similar Dredging & Pumping Operator Safety Measures.
All of 207/750 Area	Craft Labor	See Hazards A, B, C, D, E in Table 3-14.	See Safety Measures in A, B, C, D, E in Table 3-14.
Laboratory	Laboratory Supervisor	See Hazards A, B in Table 3-14. See Electrical Hazards in C. from Table 3-14. See Trips, falls, slipping; Improper lifting; and Injuries related to personal conduct from E. in Table 3-14. Testing and handling chemicals in the laboratory.	See Safety Measures A, B in Table 3-14. See Safety Measures for C.in Table 3-14. See Safety Measures for E in Table 3-14. See specific laboratory safety measures in HASP, Laboratory Safety Procedures, and MSDS.
Laboratory	Laboratory Technicians	Similar to Laboratory Supervisor Hazards.	Similar to Laboratory Supervisor Safety Measures.

SECTION 4.0 HAZARD COMMUNICATION

4.1 INTRODUCTION

In accordance with OSHA Standard 29 CFR 1910.120(O)(1), "Operations involving hazardous waste storage, disposal and treatment facilities under 40 CFR Parts 264 & 265 pursuant to RCRA..." are required to "implement a hazard communication program meeting the requirements of 29 CFR 1910.1200". The complete "Written Hazard Communication Program" for HNUS ENVIRONMENTAL TECHNOLOGIES GROUP can be found in the HNUS Health and Safety Program Manual, Section 4.

4.2 SCOPE

This section details the requirements of 1910.1200 and how the SEP remediation operations should safely handle hazardous chemicals in order to ensure that:

- No one is exposed to significant risk of harm.
- Neither the buildings nor equipment is damaged or suffers impairment of normal function from planned activities.
- No unplanned release to the environment occurs because of hazardous chemicals present at the site.

Specific objectives that support this overall goal include the following:

- Employee exposures to chemicals posing health hazards shall be kept within the limits specified in applicable governmental regulations. Furthermore, such exposures shall be kept as low as reasonably achievable (ALARA).
- Releases of hazardous chemicals to the environment shall be kept within the limits prescribed by applicable governmental regulations.

4.3 APPLICATION

The requirements of this section apply to all HNUS employees and subcontractors personnel involved in the Solar Ponds project.

4.4 HAZARD ASSESSMENT

Chemicals handled at the SEP site are, for the most part, in the form of a waste product. The waste product contains numerous potentially hazardous constituents but at relatively low levels. A detailed list of contaminants and their respective concentrations in the waste are included in Section 3, Hazard Assessment.

4.5 MATERIAL SAFETY DATA SHEETS

Because the chemicals listed in Section 3 are constituents of a waste stream, manufacturer's material safety data sheets are not available for these products. Information sheets containing relevant chemical and health data for these chemicals have been developed and are included in Section 3.

The chemical products used in any operations at the SEP site must include Material Safety Data Sheets (MSDS). The information contained in the MSDSs must at a minimum include physical characteristics and properties of the materials, routes of exposure, exposure limits, and symptoms of exposure. MSDS must be made available for review by all personnel, visitors, and inspectors working at or visiting the site.

MSDS will be maintained at the work-site for review by all personnel.

4.6 TRAINING

HNUS personnel and affiliates working on the SEP site shall successfully complete the training requirements detailed in Section 11 of this plan. One of the training requirements for personnel working at the SEP site includes Hazard Communication training. The Hazard Communication training will be consistent with that developed for plant-wide personnel. The specialized course provided by the training department is entitled **HAZARD COMMUNICATION** and is a computer aided training program addressing the hazardous materials on site and requires approximately one hour to complete. The hazards associated with the materials listed above will be addressed during on-site training.

Operational Safety Analysis (OSA) have previously been prepared for some operations at Building 788 at the SEP site. OSAs outline the safety hazards involved with specific operations, hazard controls and responsible personnel. The WO procedures delineate the personnel, administrative and functional requirements necessary to operate the waste storage area in an environmentally safe manner

according to state, federal and plant requirements. New OSA and WO procedures will be developed by EG&G for anticipated operations to be conducted at the site. This Health and Safety plan will also be revised to reflect the changes in operations or procedures.

Radiation Work permits will be used to inform personnel of hazards associated with tasks needing radiation safety measures. For non-routine tasks not appropriate for the work permit procedures, the EG&G or HNUS H&S Supervision may require the preparation of a Job Safety Analysis (a brief and limited duration OSA). The responsible supervisor on the site can inform affected employees of the hazards of any chemicals that will be present during a specific task if neither the work permit nor the job safety analysis procedure is applicable. Supervisors will document that site personnel have received adequate training prior to working on the site. Supervisors will notify H&S supervision when new operations are implemented or existing operations change that involve hazardous material usage.

4.7 CONTROLS

To protect personnel at the site, engineering controls are the preferred methods to use. Controls may include but are not limited to the use of permanent or temporary enclosures, ventilation equipment, chemical and radioactivity monitors/alarms, extinguishing equipment, safety showers and eye baths. PPE that may be needed include respirators, eye protection, gloves, and protective clothing. Details on PPE are provided in Section 6.

SECTION 5.0 SITE CONTROL

5.1 OBJECTIVES

The purpose of a site control plan is to minimize potential contamination of workers and to protect the public and the environment from hazards associated with the site. The OSHA hazardous waste operations standard, 29 CFR 1910.120, stipulates that such a plan will include the following items: a site map, identification of site work zones, a description of site communications, the requirements for the use of the buddy system, safe work practices, and identification of the nearest medical facility.

The SEP site is an access controlled site since the site is a storage and treatment area for hazardous and radioactive waste.

The terms "site control" and "controlled" versus "uncontrolled" are used in this section in the context of hazardous waste sites. This OSHA terminology does not necessarily apply to the formal radiological definitions used in the Rocky Flats Plant production facilities.

Activities conducted at the SEP site are also controlled by an EG&G Radiation Work Permit. EG&G also restricts any activity involving soil disturbance. Information required in the work permit includes job information, descriptions of hazards, radiation safety requirements, preparation for the job activities, approval signatures, and limits of the permit duration. Figure 5-1 is a copy of the work permit application. The non-radioactive safety requirements and methods of hazard control are to be detailed in the operations manuals, Operational Safety Analysis (OSA) or Job Safety Analysis (JSA) for the worksite. As specific operations and processes, and job tasks are developed, the hazards relative to health and safety protocols will be assessed and appropriate OSA and JSA prepared.

The OSA is to be prepared whenever there is risk of serious injury, exposure to toxic or radioactive materials, etc. The difference is that a JSA is to be prepared for non-routine, or one-time operations involving hazardous work or exposure.

Figure 5-2 illustrates the location of the SEP site with respect to the total Rocky Flats compound. Figure 5-3 provides a more detailed illustration of the SEP layout, and shows the exclusion zone (solar ponds), contamination reduction zone (pond berms), and support zone (areas surrounding solar ponds).

5.2 SEP SITE

The SEP area is classified as a "Radiological Controlled Area" (in accordance with RFP Health & Safety Procedures Section 10.01) since contamination levels are limited to less than 20 dpm/100 cm^2 of removable alpha activity. Signs are to be posted around the entire area by EG&G to communicate this requirement. (see Figure 5-4). Radiological controls and administrative procedures are established by Radiological Engineering and implemented by Radiological Operations.

5.2.1 SITE CONTROL FOR SPILLS

A spill of pond sludge or related SEP materials will necessitate containment or remedial actions. Incidental releases that can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate area following procedures outlined in WO-3052, rework of Triwall Pondcrete Boxes, and WO-3053, Removal of Triwall Boxes from Storage Pads. Appropriate radiological postings will be erected by the EG&G RPT at the site. The exclusion zone will encompass a radius of sufficient distance from the product to allow for adequate materials handling and logistical needs prior to decontamination. The RPT shall establish a contamination reduction zone (CRZ), or corridor, immediately adjacent to the exclusion area. The CRZ will serve as the site for the decontamination of personnel and equipment when exiting the exclusion zone. The CRZ should be approximately 10' by 30' in size in order to facilitate adequate decontamination. The area beyond the exclusion zone and CRZ will serve as the support zone. Efforts must be taken to control the spread of fugitive dusts and vapors from spilled material. Such efforts may include the use of HEPA-filtered dry vacs or HEPA-filtered wet vacs, tarps, "Floor-Dry" or similar absorbent materials.

Individuals involved in work within the exclusion zone will operate under the "buddy system". The term "buddy" is used by OSHA which implies the availability of an assigned worker to provide emergency assistance to a fellow worker/partner. Buddy teams working at the SEP site must maintain visual or audible communications. Both members of the team need not be in the exclusion zone at the same time, providing each member is wearing adequate personal protective equipment and could immediately assist each other if necessary. Site communications may consist of hand-held radios and on-site telephones.

HNUS personnel will not clean up spills. Upon discovering a spill, HNUS will notify EG&G to immediately schedule EG&G personnel to respond to, and clean up the spill. For release or spill of any material that can not be absorbed, neutralized or otherwise

controlled at the time of release by employees in the immediate area, the HAZMAT team should be contacted at extension 2911.

5.3 GENERAL OPERATING PROCEDURES

Standard safety guidelines for On-site personnel are addressed in the HNUS document entitled "Health and Safety Program Manual". Work safety practices associated with materials handling are addressed in Section 7 of this document.

The possession or consumption of food, drink, or tobacco products is prohibited within the confines of the SEP site. A break trailer is provided at the site for these activities. In addition, personal belongings shall be stored in the designated trailer. Individuals performing any task at the SEP site are required to wash hands before eating, drinking, smoking or leaving the site. Drinking water, and shower facilities shall be made available to site personnel prior to initiation of any operations at the site.

PPE (Personal Protective Equipment) will be only used if engineering and administrative controls do not reduce worker exposures below RFP action levels. The effectiveness of control measures will be verified by measuring with real time monitors or other sample devices.

EG&G will assign lockers to all HNUS field personnel. HNUS personnel involved in hands-on operations will dress out in EG&G Level D gray overalls prior to going to the solar pond area. This attire will be supplemented as necessary with modified Level D, or Level C. At the conclusion of the work day, HNUS personnel will remove EG&G supplied clothing and shower before dressing out in street clothes.

5.4 COMMUNICATIONS

Communications are available to the unit operators through the use of hand-held radios and telephones. A EG&G public address system is available throughout the pad for on-site communications and emergency notifications. See also Section 13 of this document.

5.5 SITE ADMITTANCE

The SEP area will be posted as an area in which workers are required to have specialized training. As defined in Section 11, either 24 or 40 hours of hazardous waste site training (HAZWOPPER) training is required to access the "Restricted Area" (see Figure

5-4). Access will be denied to workers who do not have verification of required training.

In order for visitors to gain access to the site, they must obtain a dosimeter from the EG&G Dosimetry Department in Building 123; register on site with the site Operations/Maintenance Supervisor; be shown the site health and safety plan; be given a basic building indoctrination; be escorted while on site by a person with a minimum of 24 hours of hazardous waste site training and radiological worker training; sign in and sign out on the Radiological Work Permit; and will only be allowed to enter areas where there is no reasonable possibility for exposure to safety or health hazards.

Figure 5-1

RADIATION WORK PERMIT

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☐ EXTENDED

RADIATION WORK PERMIT
Rocky Flats Plant

NO: 123456789
DATE:

Specific Task or Operation

WO/Procedure #

Location: Bldg___ Rm___
Area:

Supervisor: Phone___
Name:
Empl # Dept

RWP Starts
Date
Time

RWP Ends
Date
Time

R E Q U I R E M E N T S

Protective Clothing
___ Inspection Only
___ Coveralls
___ Shoe Covers
___ Surgeon Gloves
___ ___pair
___ Anti-C Coveralls
___ Wet Suit
___ Plastic Booties
___ Rubber Boots
___ Hood
___ ___type
___ Work Gloves
___ ___type
___ Tape Openings
___ Other

Respiratory
___ Full Face, Particulate
___ Full Face, Airline
___ Supplied Air Suit
___ Portable SAAM
___ Lapel Air Sample

Containment
___ Pen
___ Tent
___ Point Source
___ Air Mover
___ HEPA Vacuum

ALARA REVIEW REQUIRED
Y — N

Dosimetry
_XX_TLD ___SRD
___EXT ___
___Other___
___Pre/Post
Bioassay
DO NOT EXCEED
___mRem/RWP

Rad Ops Coverage
___Full ___Start
___OnCall ___None

Rad Eng — Y — N
Name:
Phone:

Comments

Smear Type: A BG

S U R V E Y S

Extended RWP
Freq: S D W M R O NA

Pre/Post/Dur							
Removable							
Fixed							
mR/hr G							
mRem/hr N							
mRem/hr @ 1m							
N/G Ratio							
RPT Name							
Empl #							
Data							
Time							
RO Foreman							
Empl #							

Original - Post at work site (Return to Rad Engineering at Termination)
Copy - RWP Master File
Copy - Rad Building Engineer

Figure 5-1
(continued)

RADIATION WORK PERMIT

PAGE 2 OF 4

RADIATION WORK PERMIT
Rocky Flats Plant
Continuation Survey Sheet

NO:

Smear Type: A BG

Pre/Post/Dur							
Removable Fixed mR/hr G mRem/hr N mRem/hr @ 1m N/G Ratio							
RPT Name Empl # Date Time							
RO Foreman Empl #							

Pre/Post/Dur							
Removable Fixed mR/hr G mRem/hr N mRem/hr @ 1m N/G Ratio							
RPT Name Empl # Date Time							
RO Foreman Empl #							

Pre/Post/Dur							
Removable Fixed mR/hr G mRem/hr N mRem/hr @ 1m N/G Ratio							
RPT Name Empl # Date Time							
RO Foreman Empl #							

Retain with RWP / Send to Rad Engineering after Termination.

Figure 5-1
(continued)

RADIATION WORK PERMIT

PAGE 3 OF 4

A

RADIATION WORK PERMIT
Rocky Flats Plant

RWP #_____
DATE _____
G/N Ratio:_____

Page ___of___

PERSONNEL ROSTER

I have read and understand the requirements of the RWP and will comply with those requirements.

				Time			SRD	Ntrn	
FI	MI	LAST NAME	EMPLOYEE #	IN	OUT	CODE	Dose	*Dose	**TOTAL

CODE: 0 = Not Applicable
1 = Wore Full Face Respirator
2 = Wore Supplied Air Suit
3 = Wore In-Line Full Face Respirator
4 = Wore Lapel Air Sampler
5 = Body Counter/Internal Dosimetry

* Ntrn(Neutron) Dose = SRD Dose (x) G/N Ratio

** TOTAL Dose = SRD Dose + Ntrn Dose

Post at Work Area/Return to Radiological Engineering for Retention

Figure 5-1
(continued)

RADIATION WORK PERMIT

PAGE 4 OF 4

B

RADIATION WORK PERMIT
Rocky Flats Plant

RWP #_____
DATE _____
G/N Ratio:_____

Page ___of___

PERSONNEL ROSTER

I have read and understand the requirements of the RWP and will comply with those requirements.

				Time			SRD	Ntrn	
FI	MI	LAST NAME	EMPLOYEE #	IN	OUT	CODE	Dose	*Dose	**TOTAL

The above signed personnel were authorized to work on this RWP and did perform the work described on the RWP. _____
Job Supervisor Empl # Date

CODE: 0 = Not Applicable
1 = Wore Full Face Respirator
2 = Wore Supplied Air Suit
3 = Wore In-Line Full Face Respirator
4 = Wore Lapel Air Sampler
5 = Body Counter/Internal Dosimetry

* Ntrn(Neutron) Dose = SRD Dose (x) G/N Ratio

** TOTAL Dose = SRD Dose + Ntrn Dose

Post at Work Area/Return to Radiological Engineering for Retention

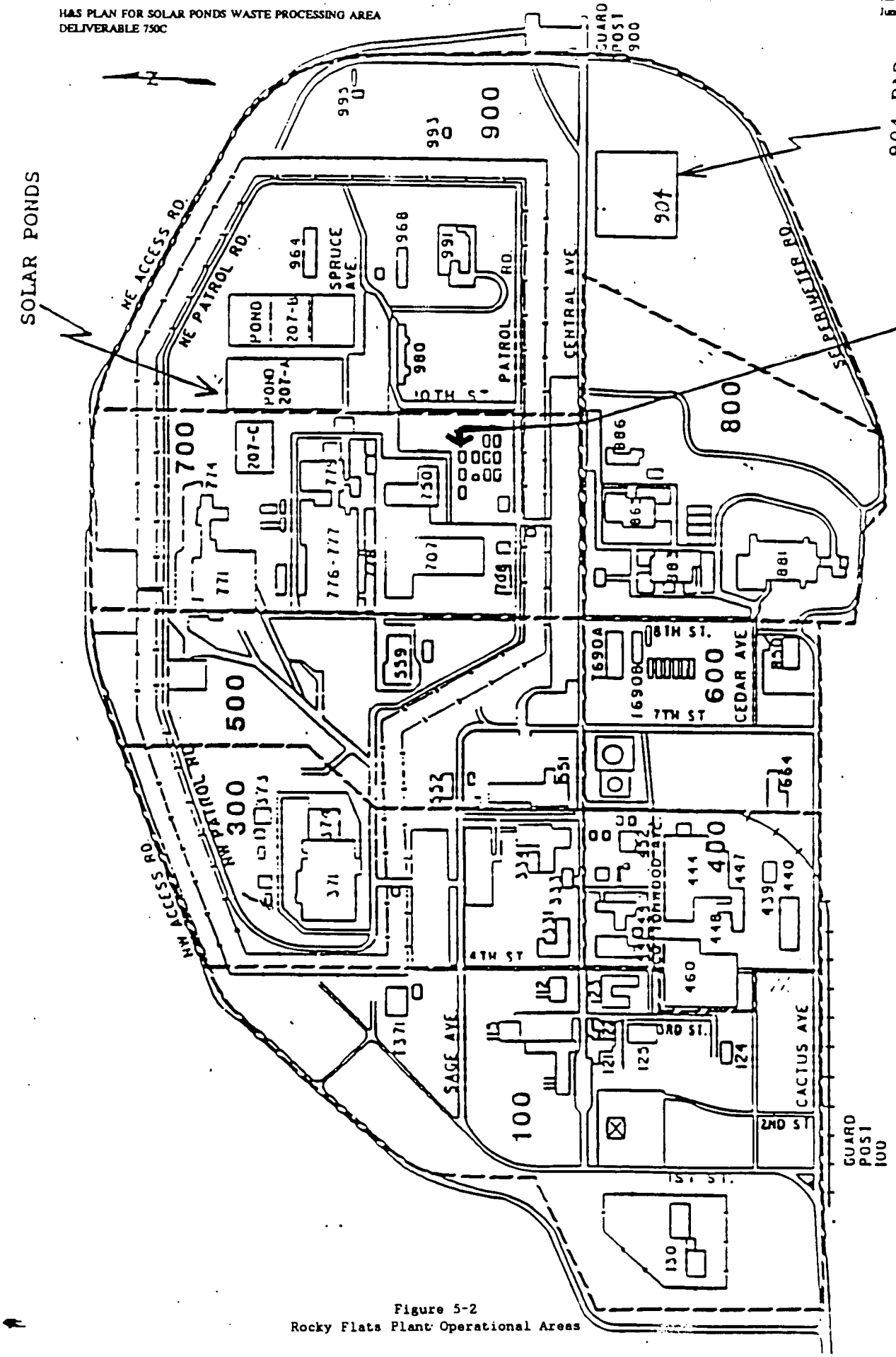


Figure 5-2
Rocky Flats Plant Operational Areas

Rocky Flats Plant Operational Areas

FIGURE 5-3
SOLAR PONDS SITE CONTROL DESIGNATION

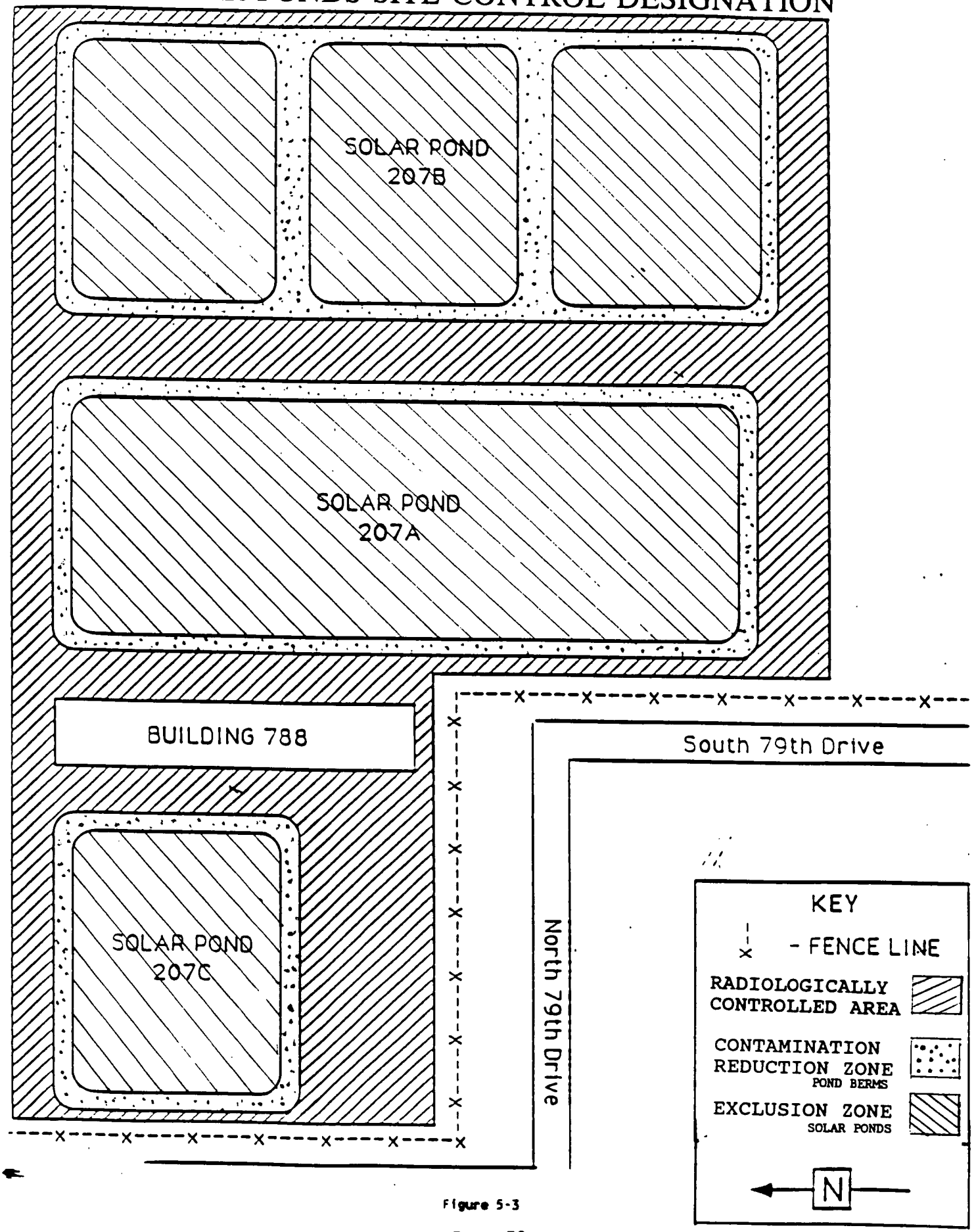
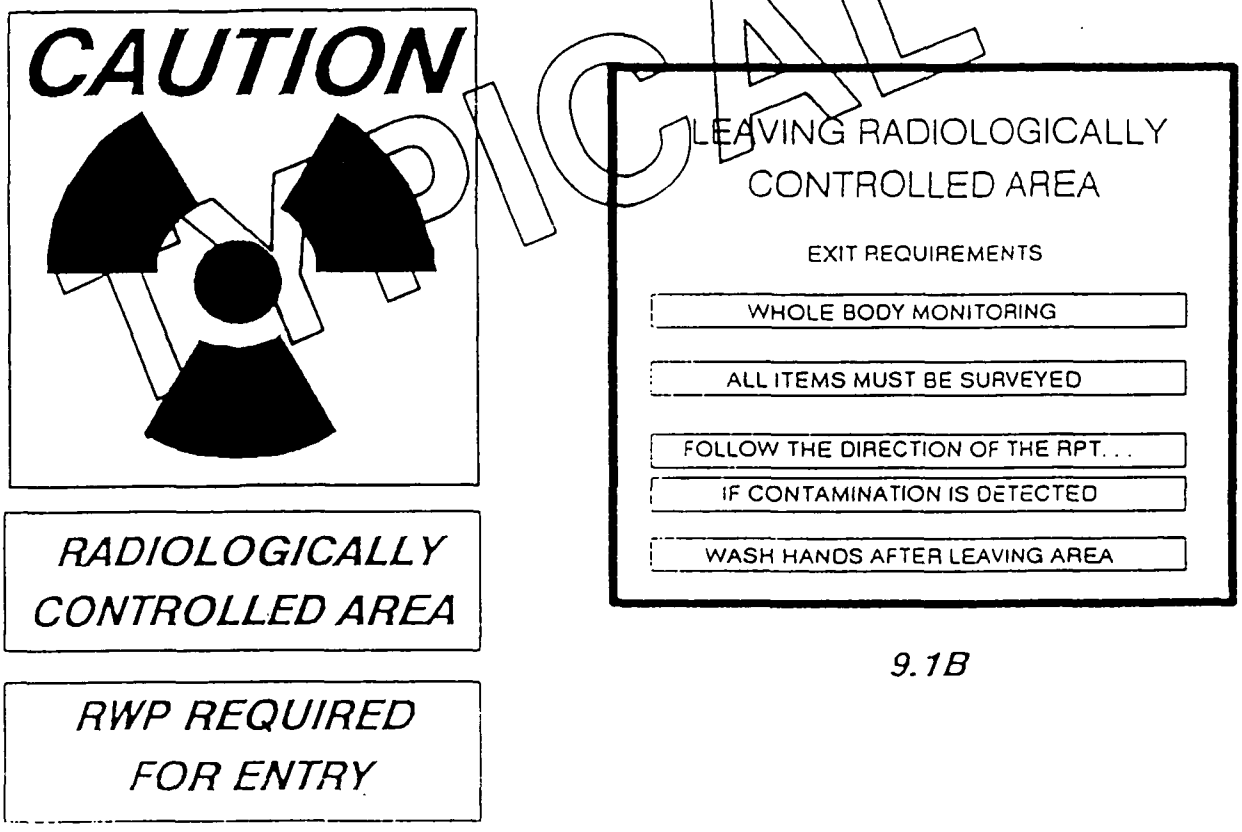


Figure 5-4
POSTING FOR RADIOLOGICALLY CONTROLLED AREA



Radiologically Controlled Area Entrance (Attachment 9.1A) shall be posted at the normal entry to a temporary RCA to define access control, due to the presence or anticipation of radiation, contamination and/or the potential for radioactive material release.

SECTION 6.0 PERSONNEL PROTECTION

This section describes the administrative and engineering controls, and personnel protective equipment that will be required for the solar pond processing activities.

6.1 ADMINISTRATIVE CONTROLS

Administrative controls include medical monitoring and training. All personnel will be medically certified and will have a current respirator fit test. These individuals will have completed appropriate 1910.120 training and will be current with respect to the 8-hour annual refresher training. They will have read the SEP Health and Safety Plan and will have received appropriate EG&G training as described in Section 11 of this document before beginning work on the site.

As discussed in the risk analysis and hazard assessment section of this health and safety plan, the pathway for inhalation of and skin contact with solar pond water and sludge can result from splashing and spray. This activity is aggravated at increased wind velocities. Therefore, work will cease and the pond area will be evacuated when the wind speed reaches a sustained 15 miles per hour to minimize accidental exposure to splashing and wind-blown spray. No eating, smoking, drinking, or chewing will be allowed during solar pond sampling activities.

6.2 ENGINEERING CONTROLS

Equipment design and construction will incorporate features for workers and environmental protection. DOE directives and RFP policy dictate that radiation exposure in the workplace should be reduced to levels as low as reasonably achievable (ALARA) through facility design and control. Release of airborne radioactive materials is to be avoided through design, typically confinement and double HEPA (High Efficiency Particulate Air) filtration ventilation systems.

Field operators will be physically isolated from pond material since they will use a remotely controlled dredge to remove material from the ponds. HNUS operators will not actually be on the ponds. The trashscreen and trashbox will be enclosed to control splashes and leaks. Double-wall piping designs will be utilized, with appropriate leak detection systems, to minimize the likelihood of

any spills and leaks in the process area. Operating equipment will be constructed on skids with appropriate spill containment pans, or otherwise located within the pond bermed area so that any spills will be contained within the pre-existing berms. Tanks will be constructed with secondary containment and leak detection systems. During operations, EG&G will provide monitoring for airborne and surface radioactivity.

6.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

6.3.1 INTRODUCTION

Standard procedures for the selection, inspection and use of personal protective equipment (PPE) at the SEP site are addressed in this section. The criteria used to determine appropriate levels of protective equipment include the work being conducted; potential chemical, radiological and mechanical hazards at the site; availability of monitoring data; effectiveness of engineering exposure controls; and applicable regulations.

A variety of federal agencies dictate the need for PPE at hazardous waste sites and RCRA Treatment and Storage facilities. Among these agencies are OSHA, EPA, and DOE. Table 6-1 lists the specific OSHA standards which impact the manufacturing, selection, and use of PPE. The specific PPE requirements will be determined for each operational task.

The actual selection of PPE is a complex matter which must be evaluated by the Occupational Safety, Radiological Engineering and Industrial Hygiene specialists. Any deviation from the protocols established in this document must be approved by EG&G and HNUS H&S supervisors prior to beginning any operations at the site.

The PPE program must also be reviewed and/or revised if:

- Significant changes are made to site structures or operations.
- Air monitoring results indicate an increase above or decrease below those readings considered characteristic of the operation.
- Employees note a change in odors, dust generation, skin or respiratory irritation.
- A spill occurs.
- Or otherwise at least annually.

PPE (Personal Protective Equipment) will be used if engineering and administrative controls do not reduce worker exposures below RFP action levels. The effectiveness of control measures will be verified by measuring with real time monitors or other sample devices.

TABLE 6-1

OSHA STANDARDS FOR USE OF PPE

TYPE OF PROTECTION	REGULATION	SOURCE
GENERAL	29 CFR Part 1910.132	41 CFR Part 50-204.7 General Requirements for Personal Protective Equipment
	29 CFR Part 1910.1000	OSHA Rulemaking
	29 CFR Part 1910.1001-1045	OSHA Rulemaking
EYE & FACE	29 CFR Part 1910.133(a)	ANSI Z87.1-1968 Eye & Face Protection
NOISE EXPOSURE	29 CFR Part 1910.95	41 CFR Part 50-204.10 & OSHA Rulemaking
RESPIRATORY	29 CFR Part 1910.134	ANSI Z88.2-1969 Standard Practice for Respiratory Protection
HEAD	29 CFR Part 1910.135	ANSI Z89.1-1969 Safety Requirements for Industrial Head Protection
FOOT	29 CFR Part 1910.136	ANSI Z41.1-1967 Men's Safety Toe Footwear

6.3.2 GENERAL APPLICATION OF PPE

The use of PPE is required when engineering and administrative controls are insufficient to prevent all exposures to hazardous chemicals and radioactive materials, or to enact ALARA policy. It is anticipated that all personnel assigned to the site will be required to wear PPE. Therefore, all personnel must be trained in the proper inspection and use of PPE before initiating work on the site.

All site field personnel must have a medical "fit for duty" clearance by a competent occupational health physician which is current. PPE may not be used if the medical clearance is expired. Personal protective equipment (PPE) is required for the solar pond site to keep exposures to hazardous chemicals and radionuclides that are present in solar pond water and sludge at ALARA levels (as low as reasonably achievable) per DOE orders. The ALARA order and hazard assessment and risk analysis in Section 3 of this document requires Level D protection for routine operations activities that will be supplemented with modified Level D, or Level C, as needed. The latter Levels will be needed if there is a potential for unexpected inhalation of or contact with radionuclides or hazardous chemicals. All field personnel and supervisors will have received OSHA training in the inspection and proper use of PPE. Personnel required to wear an EG&G respirator will have completed the EG&G respirator indoctrination and have an EG&G fit test, per Section 11.0 of this document.

EG&G will assign lockers to all HNUS field personnel. HNUS personnel involved in hands-on operations will dress out in EG&G Level D gray overalls prior to going to the solar pond area. This attire will be supplemented as necessary with modified Level D, or Level C. At the conclusion of the work day, HNUS personnel will remove EG&G supplied clothing and shower before dressing out in street clothes.

The items of PPE that will be worn while performing duties at the SEP site are listed in Table 6-3. The dressout procedure that will be followed for operations activity is shown in Table 6-2.

TABLE 6-2

TYPICAL PPE DRESS-OUT PROCEDURE

	PPE LEVEL		
	D	MOD. D	C
• Don EG&G gray coveralls (and underwear, if needed), and safety shoes or boots	X	X	X
• Don boot covers		X	X
• Don safety glasses and hard hat (if needed)	X[2]	X[2]	X[2]
• Obtain chemical resistant outer gloves for wet product handling, or double surgical gloves for dry product handling[3]		X	X
• Don Saranex or Tyvek overalls as necessary and two pairs of surgical gloves		X	X
• Tape outer surgical glove to Saranex or Tyvek coveralls		X	X
• Tape Saranex or Tyvek to Oak Ridge (plastic) boot covers		X	X
• Don respirator			X
• Don cotton hood			X
• Tape respirator/hood interface			X
• Check respirator fit			X
• Tape outer gloves to Saranex or Tyvek		X[1]	X
• Chemical Resistant Goggles and Face Shield		X	
• Leather Gloves		X	

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[1] As required when assisting personnel in decontamination, or as specified in OSA or JSA.

[2] This requirement for safety glasses may be waived when full-face respirators are worn; and for hard hats when head protection is not needed.

[3] Glove choices may include Viton, Nitrile, Polyvinyl chloride, Butyl, or Neoprene. If the weather is cold, Butyl and Neoprene are better choices.

TABLE 6-3
PERSONNEL PROTECTIVE EQUIPMENT

	LEVEL C	MODIFIED LEVEL D	LEVEL D
HEAD	(x) Cotton Hood/(EG&G)	(x) Hard Hat (2)	(x) Hard Hat (2)
EYE & FACE	( )	(x) Safety Glasses or chemical resistant goggles, or face shield.	(x) Safety Glasses
HEARING	(x) Ear Muffs or Plugs	(x) Ear Muffs or Plugs	(x) Ear Muffs or Plugs (3)
ARMS & LEGS ONLY	( )	( )	( )
	(x) Cotton Coveralls Grey (EG&G)	(x) Cotton Coveralls Grey (EG&G)	(x) Cotton Coveralls Grey (EG&G)
WHOLE BODY	(x) Saranex/Tyvek	(x) Saranex/Tyvek	( )
APRON	( )	( )	( )
HAND - Gloves	(x) Inner - Latex Surgical	(x) Inner - Latex Surgical	( )
- Gloves	(x) Inner - Latex & Viton	(x) Inner - Latex & Viton	( )
- Gloves	(x) Outer - e.g. Butyl,Leather	(x) Outer - e.g. Butyl, Leather	(x)
FOOT - Boots (1)	(x) Safety Shoes with Covers	(x) Safety Shoes with Covers	( ) Safety Shoes
- Boots	( )	( )	( )
- Boots	( )	( )	( )
APR - Neg. Pres.	( )	( )	( )
- Half Face	( )	( )	( )
CART/CANISTER	( )	( )	( )
FULL FACE	(x) MSA Utratwin; or North 76008A	( )	( )
CART/CANISTER (4)	(x) (MSA) TC-21C-155; TC-23C-152 (North) TC-21C-152 or TC-23C-215	(x)	( )
PAPR	( )	( )	( )
CART/CANISTER	( )	( )	( )
TYPE C	( )	( )	( )
SAR - AIRLINE	( )	( )	( )
SCBA	( )	( )	( )
COMB.	( )	( )	( )
AIRLINE/SCBA	( )	( )	( )
CASCADE SYST.	( )	( )	( )
COMPRESSOR	( )	( )	( )
FALL PROTECTION	(x) Tether Safety Line	(x) Tether Safety Line	(x) Tether Safety Line
FLOTATION	(x) Life Preservers Will be Worn by Sampling Personnel In Boat	(x) Tether Safety Line ( ) ( )	( ) ( ) ( )
COMMUNICATION	(x) Portable Radio	(x) Portable Radio	(x) Portable Radio
BOAT	(x) Boat Will Have Positive Flotation	(x) Boat will Have Positive Flotation	(x) Boat Will Have Positive Flotation
BOAT	(x) Bow Line to Shore	(x) Bow Line to Shore	(x) Bow Line to Shore

(1) Safety shoes will be worn in the SEP area.

Not generally required when full-face respirator is used.

(3) In Posted Noise Areas.

(4) Ammonia cartridge required when working with saltcrete material.

Workers required to use modified Level D, or Level C PPE must do so in buddy teams. The teams are responsible for the inspection of each others' equipment during donning and during field use. An inspection checklist is presented in Table 6-4.

Workers experiencing any unusual symptoms of fatigue, dizziness, high body temperature, skin or respiratory irritation should immediately withdraw from the work area and be monitored by a Radiological Protection Technologist. The employee should notify his/her supervisor, and the incident should be reported immediately by the supervisor to the HNUS H&S Supervisor.

Table 6-5 lists the protective clothing requirements for PPE levels C and D. These may be the clothing requirements, dependent on the work activity. PPE may be modified by the Health & Safety disciplines.

TABLE 6-4
GENERAL PPE INSPECTION CHECKLIST[1]

I. CHEMICAL RESISTANT CLOTHING

BEFORE USE:

- Determine that the clothing material is correct for the specific task at hand.
- Visually inspect for:
  - imperfect seams
  - non-uniform coatings
  - tears
  - malfunctioning closures
- Hold up to light and check for pinholes.
- Flex product:
  - observe for cracks
  - observe for other signs of shelf deterioration
- If the product has been used previously, inspect inside and out for signs of chemical attack:
  - discoloration
  - swelling
  - stiffness

DURING THE WORK TASK, PERIODICALLY INSPECT FOR:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Closure failure
- Tears
- Punctures
- Seam Discontinuities

---

(1) Specific procedures recommended by equipment manufacturers should be followed.

II. GLOVES

- **BEFORE USE,** pressurize glove to check for pinholes. Blow into glove to check for pinhole leaks.

III. AIR-PURIFYING RESPIRATORS

- Inspect air-purifying respirators:

  - before each use
  - after each use

- Check material conditions for:

  - signs of pliability
  - signs of deterioration
  - signs of distortion

- Examine cartridges or canisters to ensure that:

  - they are the proper type for the intended use
  - the expiration date has not been passed
  - they have not been opened or used previously

- Check face shields and lenses for:

  - cracks
  - crazing
  - fogginess

- Perform positive and negative pressure tests prior to use

6.3.3 GENERAL DUTY PPE FOR VISITORS

Workers and visitors at the site who do not handle waste, products, or related equipment may use the following PPE:

- Class 1 Eye Protection,
- Safety Shoes (if working in area), and
- Hardhat (in posted areas).
- Dosimeter

6.3.4 PPE REQUIREMENTS FOR ON-SITE CLEAN UP

The PPE requirements for spill clean-up crews should be determined by evaluating the materials associated with the waste at the site and the inherent risks associated with the materials. The actual selection of PPE is a complex matter which must be evaluated by the EG&G and HNUS H&S supervisors.

6.3.5 RE-USE OF PPE

Respirator cartridges have a full shift service life, providing they are not saturated with moisture, breathing resistance is not excessive, and chemical odors are not detected. Authorization for cartridge re-use must come from H&S supervision. Workers are not authorized to change cartridges. They must be sent back to the Plant laundry where Laundry personnel are authorized to change cartridges. Respirators can be sent back to the Laundry as often as is needed by the worker. However, the respirator should go back for servicing by the Laundry at least every 30 days.

Respirators should be wiped clean by site personnel as needed. They must be stored in a plastic bag with the cartridge side down. The respirator should be placed so that distortion of the facepiece does not occur. Hardhats, safety glasses and safety shoes may be wiped clean as necessary, and re-used unless informed otherwise by radiological, or health and safety specialists.

Disposable clothing items are to be discarded after use in appropriate waste containers. Non-disposable clothing is to be placed in appropriate receptacles at the shower/locker facility for subsequent cleaning by the plant laundry.

TABLE 6-5
CRITERIA AND LIMITS OF PROTECTION FOR PPE LEVELS C AND D

LEVEL OF PROTECTION	EQUIPMENT	PROTECTION PROVIDED	SHOULD BE USED WHEN:	LIMITING CRITERIA
C	RECOMMENDED: • Full-face piece, air-purifying, canister-equipped respirator. • Chemical-resistant clothing (coveralls and long-sleeved jacket; hooded, one or two piece chemical splash suit; disposable chemical-resistant one-piece suit). • Inner and outer chemical-resistant gloves. • Chemical-resistant safety boots/ shoes. • Hard hat. • Two-way radio communications. • Splash resistant clothing (Tyvek) OPTIONAL: • Disposable boot covers. • Face shield. • Escape mask. • Long cotton underwear.	A lower level respiratory protection than Level B, but the same level of skin protection since the atmospheric contaminants, splashing liquid, or other direct contact will not adversely affect, or be absorbed through exposed skin.	• The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin. • The types of air contaminants have been identified, concentrations measured, and a canister is available that can remove the contaminant. • All criteria for the use of air-purifying respirators are met.	• Atmospheric concentration of chemicals must not exceed IDHL levels. • The atmosphere must contain at least 19.5 percent oxygen.
D	RECOMMENDED: • Coveralls. • Safety boots/shoes. • Safety glasses or chemical splash goggles. • Hard hat. OPTIONAL: • Gloves. • Escape Mask. • Face shield. • Disposable coveralls (Tyvek/Saranex or aprons)	No respiratory protection. Minimal skin protection.	• The atmosphere contains no known hazard. • Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.	• The atmosphere must contain at least 19.5 percent oxygen. • Coveralls

SECTION 7.0 MATERIAL HANDLING PROGRAM

7.1 HAZARDS

Hazards associated with materials handling during operation of the SEP site are identified below. After more information becomes available for equipment design, layout, and construction, more specific materials handling precautions will need to be identified through the OSA or JSA procedures. The potential for personnel injury during SEP site operations may be related to the following operations or processes:

- Truck, crane and forklift operations
- Moving and unloading equipment on trailers
- Handling equipment in containers, and removing packaging from the equipment
- Use of slings and/or pry bars to handle and move equipment
- Use of hand tools for unloading equipment and equipment adjustments during operations and maintenance
- Operating the mixers and other equipment with moving parts
- Use of ladders and/or platforms
- Slippery (icy) conditions on ladders, platforms, equipment, roadways, and ponds
- Use of reclaim equipment with powered motors, and suction hoses
- Operating electric powered motors, especially under moist, or wet conditions
- Removing material from the trashscreen and trashbox
- Flushing equipment on ponds with pressurized water system

Personnel injury could be caused by falls while operating during windy conditions or when ice or snow conditions exist. Injuries from falling boxes or crates are always possible during handling operations that involve the use of forklifts, trailers, or lifting slings. Cutting injuries may occur through careless handling or improper use of cutting tools.

7.2 ACCIDENT PREVENTION

The following are suggestions for preventing personnel injury during materials handling.

- Identify and post hazardous work areas.
- Do not enter hazardous work areas unless required by your job duties.
- Use safety equipment to limit hazards.
- Know the location of emergency and safety equipment including eye wash stations, safety showers, fire extinguishers, and telephones in the work area.
- Wear appropriate personal protective equipment (protective clothing, gloves, hardhats, eye protection, respiratory protection, safety shoes, etc.) as noted in Chapter 6 of this plan.
- Do not operate a forklift or hoisting and rigging equipment without proper training and current license. Learn crane operating limits, and do not lift loads over personnel.
- If ground is snow-covered or icy, suspend unloading, moving, and other forklift and vehicular operations. Upon approval, commence operations under the direction of health and safety representatives. Prerequisites for approval may include removal of snow or ice, spreading of sand and/or salt, and use of proper vehicle equipped for snow.
- Prevent use of defective equipment by visual examination of equipment for wear and tear before use, according to applicable health and safety guidelines.
- Use only properly grounded electric power tools, lighting, and equipment, according to health and safety guidelines. This might include proper grounding, double-insulated tools, or ground-fault circuit interrupters (GFCI's).
- Use proper lighting during night operations, especially to prevent slip, trip, and fall hazards due to improper lighting. This may require special equipment and approvals from health and safety representatives.
- Maintain dry surfaces when working with electricity. Turn off electric power service to prevent energizing potentially hazardous (e.g. wet) areas

- Maintain the work area in a neat and orderly condition, and in accordance with the building housekeeping plan.
- Return all tools, equipment, and supplies to their proper place after use.
- Be familiar with the operation of equipment including pumps, material handling equipment, motors, mixers, tanks and related power supply systems.
- Maintain familiarity with health and safety procedures.
- Complete and understand all applicable health and safety and related plant training courses.

SECTION 8.0 DECONTAMINATION

8.1 INTRODUCTION

The objectives of decontamination are to remove hazardous substances from workers and equipment; to assure compliance with DOE order 5480.11 and OSHA standards (29 CFR, 1910.120); and to preclude the occurrence of related adverse health effects. This chapter specifies decontamination techniques for the SEP site.

The principal health effects which could be associated with inadequate decontamination procedures at the SEP site include skin irritation as a result of contact with high pH water from 207C; exposure to small quantities of mixed solvent vapors and/or cyanide compounds by inhalation and through the skin; and inhalation and/or spread of radiological materials. Proper decontamination is also an important means of public health protection through the isolation of contaminants to prevent radioactive materials from being carried off-site to one's residence or other facilities.

Decontamination procedures will differ slightly between the stabilization operations based on the amounts of contaminants identified, the actual processes used, and the mobility of the contaminants.

8.2 COMMON PROCEDURES FOR SEP AREAS

Reusable items will be monitored for radiological contaminants and visual contamination to verify that they have been adequately decontaminated. The absence of radiological contamination is defined as less than or equal to that for an uncontrolled area per Table 10-3 as measured with radiation survey instruments capable of detecting these levels. Disposable products shall be contained in drums or crates as hazardous waste, or restricted to the exclusion zone.

Reusable products may be cleaned in the CRZ (contamination reduction zone) and dried on-site for re-use at a later time. No material may exit the exclusion zone before being either decontaminated and verified as such or contained. Respirators will be returned to the Plant Laundry for cleaning every 30 days or as needed.

All wash solutions used for decontamination shall be contained in tubs, pans or drums, and returned to the appropriate pond (or clarifier) and used as process water for the mixing of future batches of concrete half-crates. Containers will be designated for process waste and used for no other purpose.

The actual removal of PPE within the CRZ shall consist of the following protocol:

1. Remove visible debris or liquids on PPE with disposable towels.
2. Remove tape
3. Remove outer boot covers
4. Remove outer gloves
5. Remove or cut off disposable coveralls and disposable Oak Ridge (plastic) boot covers (if utilized)
6. Survey for radiological contamination, before stepping out of the CRZ into the clean area
7. Remove mask, wipe off with disposable towels
8. Remove inner gloves

Be certain to roll coveralls off inside out to prevent skin contamination.

All equipment (decontamination, process, and sampling) will be subjected to smear sampling by the RPT to confirm the effectiveness of radioactive decontamination. All contaminated disposable sampling and decontamination equipment, will be segregated into like materials (e.g., PPE, equipment, etc.) and placed into a clear plastic trash bag (provided by EG&G). The bag will be sealed with tape, labelled as solar pond sampling waste and a date put on the label. The bagged solid wastes will be drummed and managed by EG&G waste operations personnel, by IDC code.

8.3 PREVENTION OF CONTAMINATION

Workers shall minimize contact with potentially contaminated products. Minimization efforts shall include:

- Avoiding stepping into product unnecessarily
- Covering instruments and tools and work area floor with plastic when possible
- Utilizing engineering controls to the extent possible to prevent/control dust emissions
- Minimizing splashing
- Controlling access points

- Keeping area clean and removing spilled material promptly
- The use of equipment and tools to minimize contact with the materials
- Use of RFP lockers, change rooms, and clothing
- Mandatory showers at the end of the work shift for field personnel

8.4 DECONTAMINATION EQUIPMENT

Table 8-1 describes suggested equipment and supplies for On-site decontamination.

8.5 EQUIPMENT DECONTAMINATION

Small tools, instruments, and other pieces of equipment are to remain within the contamination reduction zone until they are adequately cleaned and confirmed to be free of radiological contamination (Table 10-3, Uncontrolled Area alpha and beta/gamma radiation contamination control limits) and visible residual contamination. Small items should be cleaned with dry wipes if possible to facilitate the alpha survey necessary for decontamination verification.

Large pieces of equipment such as forklifts will be frisked with radiation survey instruments and dry wiped as needed to meet radiological decontamination standards. Such equipment should be rinsed with clean water and/or steam and inspected by the RPT prior to being transferred from the pad. Equipment leaving the Controlled Area will be monitored as stipulated in EG&G - Rocky Flats procedures HSP 18.10.

Equipment decontamination will be conducted in Level C or modified Level D PPE.

TABLE 8-1

EQUIPMENT FOR DECONTAMINATION OF PERSONNEL AND PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

- Drop cloths of plastic or other suitable materials on which heavily contaminated equipment and other protective clothing may be deposited.
- Soap solution to remove contaminants.
- Plastic wash tub for cleaning small items.
- Long-handled, soft bristled brushes to help wash and remove contaminants from equipment.
- Kimwipes for wiping protective clothing and equipment.
- Lockers and cabinets for storage of decontaminated clothing and equipment.
- Metal drums or plastic bags for solid waste (e.g., used Kimwipes).
- Collection containers, such as large plastic bags, drums, or suitably lined trash cans for storing disposable clothing and heavily contaminated personal protective clothing or equipment that must be discarded.
- Emergency shower in Permacon units and personnel shower facilities.
- Soap or wash solution, and disposable or cleaned towels, for the change room showers.
- Lockers or closets for clean clothing and personal item storage.

SECTION 9.0 MEDICAL SURVEILLANCE

9.1 INTRODUCTION

The medical surveillance requirements of the OSHA standards (29 CFR, 1910.120(f)) provide the framework for a medical monitoring program for workers in hazardous waste and emergency response operations. The standard includes provisions for baseline, periodic, and termination medical examinations to monitor for potential exposures to hazardous material.

In general, the principal objectives of the medical surveillance program are to:

- Provide respirator certification as required under 29 CFR 1910.134
- Determine an individual's ability to perform work while wearing protective equipment
- Assist in evaluating the adequacy of the personal protective equipment prescribed.
- Establish a physiological baseline necessary to assess the degree and/or effects of exposure to hazardous materials
- Provide data for future epidemiological studies and evaluations

9.2 FREQUENCY OF MEDICAL EXAMINATIONS

Subcontractors meeting the requirements of 29 CFR 1910.120(f) and RFP employees assigned work at the SEP site must undergo a baseline medical examination prior to initiating On-site activities. After the initial exam, employees must have a follow-up medical exam at least once a year; an attending physician may suggest a shorter or longer interval, but not in excess of two years.

RFP employees and subcontractors must also receive a medical examination as soon as possible if the employee is injured or becomes ill from exposure to hazardous substances on site or during an emergency; of if the employee develops signs or symptoms that indicate a possible overexposure to hazardous substances. All potentially exposed employees must be trained to recognize symptoms such as dizziness or skin rash that may be indicative of an exposure.

When a worker is reassigned and will no longer be exposed to hazardous substances or terminates employment, a final medical exam is required if the employee has not had an exam within the past six months.

The Occupational Health Director or the subcontractor's medical director may elect to have examinations, consultations, and/or testing conducted on a more frequent basis. Such a decision may be based on one or all of the following factors:

- Chemical or physical agents employees may be exposed to while working in or around the site (See Section 3.0 "Hazard Assessment")
- Concentration(s) of chemicals determined during area and/or personal air monitoring
- Health effects experienced by employees that may be associated with hazards at the site
- Acute exposure(s) as a result of an emergency

9.3 CONTENT OF MEDICAL EXAMINATIONS

The content of the medical examination will be determined by the subcontractor's medical advisor with input from the RFP Medical Department, and may include the following key elements:

- A complete occupational and medical history emphasizing those signs and/or symptoms associated with exposure(s) to the hazardous materials
- Baseline bioassay of Radioisotopes
- Smoking history
- Chest X-Ray
- Pulmonary function test (PFT)
- Electrocardiogram (EKG)
- Blood test and analysis for metals
- Urine test and analysis for metals
- Liver function test
- Examination of eye, nose, and throat

- Examination of the nervous system
- Examination of the spine and other musculoskeletal system
- Audiogram
- Pulse rate
- Body temperature

The examining physician will provide a written opinion of the employee's ability and fitness to perform the required job task(s) and wear a respirator. The physician will take into consideration, among other factors, the fact that the employee may:

- Experience hot and cold temperature extremes as a result of environmental conditions and/or wearing protective clothing
- Exert themselves physically as a result of performing the required job tasks
- Wear a respirator when required

The content of the follow-up examination and employee termination examination will be determined by the attending physician, with consideration given to making comparisons to previous data; detecting early signs of adverse health effects; and facilitating protective measures.

9.4 AVAILABILITY OF SERVICE

The Occupational Health Department is located in Building 122. The full staff is on duty from 7:30 a.m. to 4:00 p.m. Monday thru Friday. The registered nursing (R.N.) staff is on duty from 6:30 a.m. Monday through 10:00 p.m. Friday. A physician and a nurse are always on call for an emergency during off hours. Weekend coverage (Friday 10:00 p.m. through Monday 6:30 a.m.) is provided by emergency medical technicians (EMTs). They can be contacted at Extension 4336 and will meet employees and subcontractors in the Occupational Health Department or respond to the site of any emergency.

9.5 TRANSPORTATION FOR MEDICAL REASONS

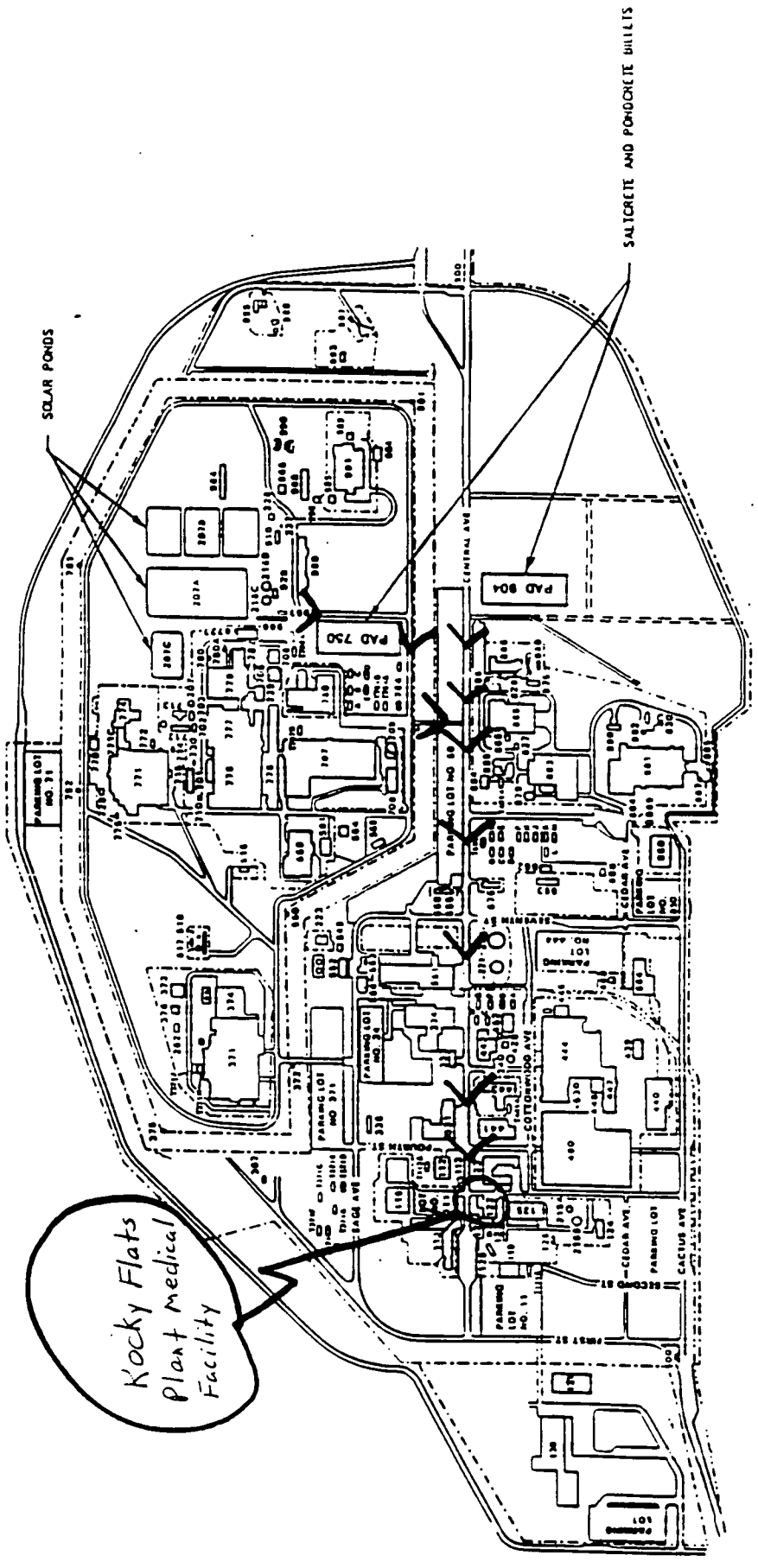
Transportation will be arranged (if it is medically safe as determined by the Occupational Health Staff) either to their home or to an appropriate medical facility as described below:

- For an emergency, call x 2911. EG&G Rocky Flats Medical/EMTs will determine the appropriate mode of transportation for illness/injury requiring air or ground ambulance transport. Figure 9-1 shows the location of the Rocky Flats Plant Medical Facility at Building 122. Figure 9-2 shows the location of St. Anthony's Hospital North (2551 West 84th Avenue, Westminster, CO, 303/426-2151), which handles Rocky Flats Plant emergency cases.

- Persons with minor injuries may be transported to the RFP clinic in Building 122 for treatment.

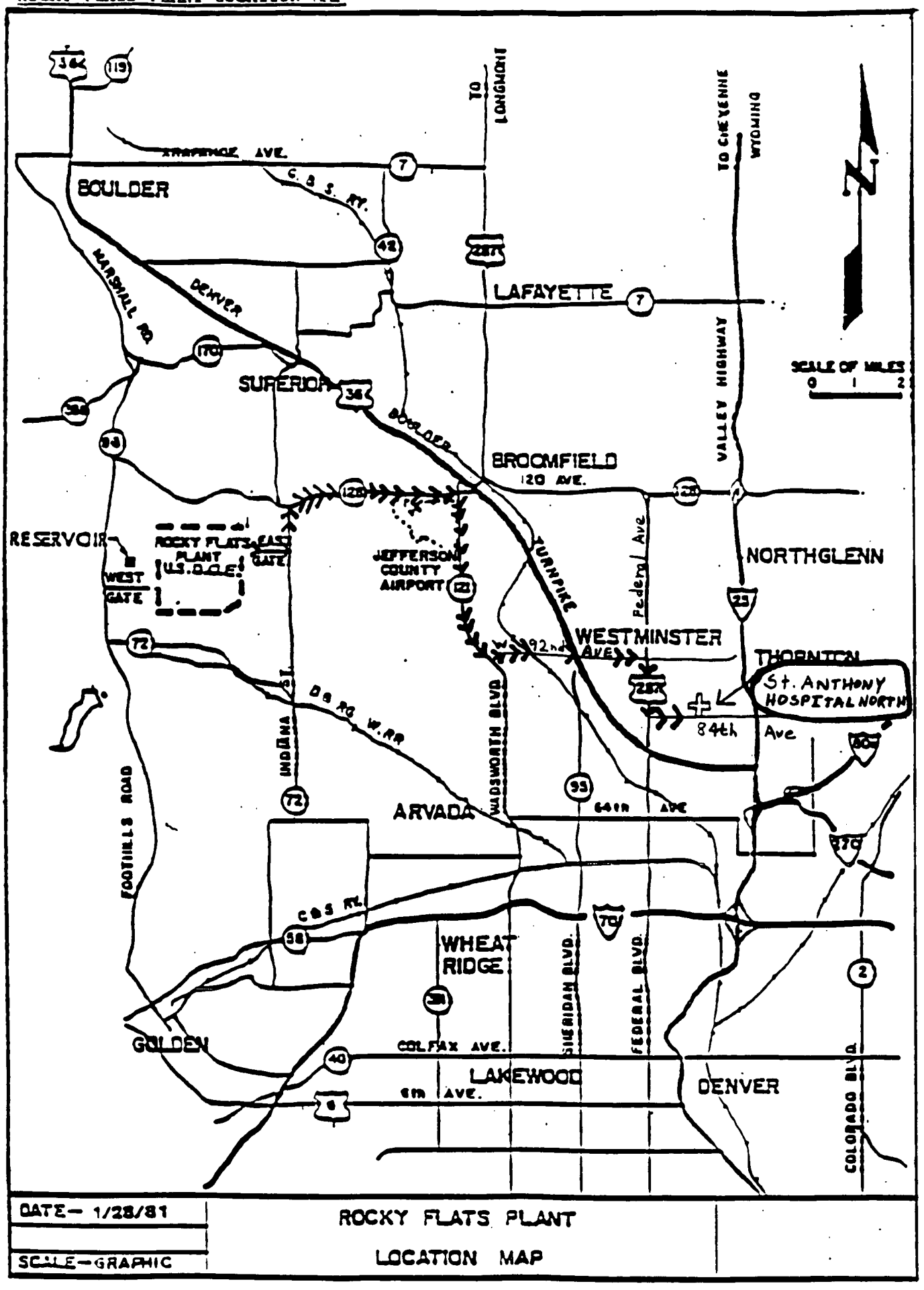
FIGURE 9-1

NUS CORPORATION



ROCKY FLATS COMPLEX
ROCKY FLATS, GOLDEN, COLORADO
NOT TO SCALE

Figure 9-1
Location of Rocky Flats Plant
Medical Facility at Building 122



DATE— 1/28/81	ROCKY FLATS PLANT
SCALE—GRAPHIC	LOCATION MAP

Figure 9-2
Location of St. Anthony's Hospital North

- For a non-emergency, if there is no medical necessity for ambulance transport, supervisors will be asked to arrange off-site transportation, if any.

In an incident where a worker is injured and requires non-ambulance transport home or to an off-site medical facility, the supervisor or designee shall accompany that person as a representative of HNUS and be available to interface with medical providers, the Company (HNUS) personnel, and family members (as necessary), and to provide further transportation for the employee as appropriate. Supervisors unable to arrange transportation on weekends or during night work, should contact the Shift Superintendent (RFP Emergency Coordinator) for assistance at Extension 2914 (or the emergency Extension 2911).

9.6 MEDICAL RESTRICTIONS

The attending physician has the responsibility of assisting management in ensuring the placement of employees in work situations that will not create undue hazard(s) to the individual, co-workers, plant facilities, the public, and the environment.

9.7 SUPERVISOR'S RESPONSIBILITY

The supervisor has several responsibilities pertaining to medical surveillance. Some of these responsibilities are:

- Confirming through the Health & Safety Supervisor that employees are fit and do not have restrictions that will interfere with their job performance

- Recognizing signs or symptoms of over-exposure to chemicals or heat stress

- Sending employees for a work restriction re-evaluation (coordinated through the Health & Safety Supervisor) if there has been a change in the employees physical or mental condition

- Consulting personnel files regarding employee restrictions prior to placing a job applicant in a vacancy

9.8 EMPLOYEE'S RESPONSIBILITY

Medical surveillance is not only the responsibility of the attending physician, health & safety staff, and supervisors, but is also the responsibility of each employee. Employees have responsibilities similar to the supervisors in this area; some of these responsibilities are:

- Advising their supervisors of any physical or mental conditions which could affect work performance
- Recognizing some of the easily detectable signs of symptoms of over-exposure to chemicals or heat stress
- Reporting all occupational injuries or illnesses immediately
- Reporting to the Health & Safety Supervisor for coordination with the EG&G Occupational Health Department to have limitations verified or restrictions imposed (Restrictions recommended by an off-site physician must be presented in writing to the Occupational Health Department)
- Reporting to the designated location for medical re-evaluation as scheduled

9.9 WORK PRACTICES

Work assignments may require temporary or permanent modification of job duties based on physical, mental, and environmental factors. The attending physician will perform a medical assessment; and communicate the need for medical restriction in writing to the Health & Safety Supervisor.

9.10 MEDICAL RECORDS

All medical information will be included in the individual's confidential medical file, including laboratory reports, EKG reports, X-Ray reports, health histories, physical examinations, letters, and reports from the employee's personal or referral physician. A physician's fit-for-work statement will be maintained in the field office as verification of compliance with OSHA regulations, and to verify an individual's suitability for assigned work duties.

9.10.1 RELEASE OF MEDICAL RECORDS AND MEDICAL INFORMATION

The personal medical information obtained through the HNUS medical surveillance program shall be treated as strictly confidential, and may be released only through adherence to the HNUS corporate guidelines.

Consistent with this policy, all personnel will be requested to complete a "Medical Record Release Authorization" form and submit it to the examining physician with a completed medical history questionnaire at the time of the exam. With this release, the examining physician will be able to inform each employee and project management of an individual's physical status and ability to perform assigned job tasks on the project site with or without any specified work restrictions.

SECTION 10.0 HEALTH & SAFETY MONITORING

10.1 INTRODUCTION

The health and safety monitoring procedures associated with site operations include those for chemical contaminants and for radiological contaminants. The objectives of the monitoring program are:

- To characterize any dust, mist, fumes, gases, and vapors present in work areas and immediately outside the perimeter of the site
- To acquire sufficient quantitative data which will be used to determine appropriate levels of personal protective equipment
- To identify conditions that may be immediately dangerous to life or health

By contractual agreement, EG&G will provide radiation monitoring, and health hazard monitoring. EG&G health and safety organizations are also charged with definition of health hazards. Identified hazards will be controlled by the coordinated efforts of EG&G operations and health and safety staff, the HNUS Health & Safety Supervisor and Operations/Maintenance Supervisor.

10.2 CHEMICAL RELATED AIR MONITORING

10.2.1 SAMPLING STRATEGY

Breathing zone samples will be collected from workers with the maximum potential for exposure to airborne materials.

10.2.2 MONITORING

Based on waste materials analyses, sampling during related operations, and industrial hygiene references and regulations, personnel breathing zone samples of the following compounds will be evaluated:

- Inorganics:

  Hydrogen Cyanide (may occur if 207C Pond materials are acidified)
  Hydrogen Sulfide (may occur if ponds are in an anaerobic state)

- Metals:

  Arsenic
  Cadmium
  Chromium
  Nickel
  Silver
  Lead

- Organics:

  Total volatile organic compounds
  Tetrachloroethene
  2-Butanone (Methyl Ethyl Ketone)

- Respirable and Total Dust

  Other compounds may be monitored based on continuing evaluation by EG&G Industrial Hygiene and HNUS Health & Safety Supervision.

  Noise exposure will also be evaluated through area noise surveys, and personnel noise dosimetry.

10.2.3 PROCEDURES

Personnel breathing zone sampling will be in accordance with provisions set by the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH).

Employees will be notified of air sampling results in a timely manner.

Area and personal monitoring for compounds listed above will be performed at the start of operations, and on a regular basis

thereafter until a sufficient number of samples are collected to establish exposure levels, followed by periodic sampling as required. Initial sampling results will also be used to re-evaluate personal protection equipment requirements.

Table 10-1 lists the equipment and calibration requirements for sampling of the compounds listed above. Table 10-2 lists the permissible exposure limits and action levels for compounds which may be present at the site.

10.3 RADIOLOGICAL MONITORING

Radiological monitoring involves the detection and measurement of alpha, beta, and gamma radioactivity. Identified radionuclides include Americium 241; Plutonium 239; and Uranium 233, 234 and 238. The monitoring shall be conducted for airborne radionuclides and surface contamination. Surface contamination on equipment shall be monitored as stipulated in the EG&G Rocky Flats Radiological Operating Instructions Manual.

10.3.1 RADIOLOGICAL DECONTAMINATION VERIFICATION

All persons shall have a whole body alpha scan after having contact with radioactive materials, or prior to leaving a controlled area when deemed necessary by the RPT or Supervisor(s). Self monitoring is acceptable; however, persons shall be monitored by a Radiological Protection Technician (RPT) prior to leaving a Contaminated Area. Alpha activity should be less than 250 cpm (using a Ludlum 12-1A or equivalent) or appropriate decontamination procedures will be followed (see Table 10-3).

10.3.2 SURFACE RADIOLOGICAL CONTAMINATION SURVEYS

Radiological Engineering is responsible for overseeing routine contamination surveys for the site to include the processing areas, equipment used on the pad, break trailer, the pad storage areas, and the change rooms. The frequency of such surveys is based on the judgment of the responsible Radiological Engineer. The specific methodologies associated with surface contamination surveys are described in the EG&G Radiological Operating Instruction (ROI) 3.1. Contamination control limits for alpha and beta/gamma surface activity, as specified in the ROI are listed in Table 10-3.

10.3.3 STATIONARY RADIOLOGICAL AIR MONITORING

Fixed air samplers consisting of airhead samplers will be used for process areas, tent, permacon and ambient air monitoring. Radiological Engineering will investigate the implementation of additional air monitoring techniques as they become available for use. The limits of acceptable airborne radiological particulate exposure are referred to as Derived Air Concentrations or DACs. The DAC's are for radioactive materials found in the SEP area are listed in Table 10-4. Should exposure exceed 10% of the DAC, Level C protection shall be required. The methodology of Routine Air Sampling is described in EG&G Rocky Flats Radiological Operating Instruction (ROI) 4.1.

TABLE 10-1

SAMPLING INSTRUMENTATION

EQUIPMENT	MATERIALS SAMPLED	CALIBRATION
Constant flow air sampling pumps	Hydrogen cyanide Ammonia Metals Organics Respirable dust Total Dust	daily, before and after sampling
Colorimetric tubes (Capable of detecting at least 1/2 of the PEL and TLV)	Hydrogen sulfide Hydrogen Cyanide Organics as applicable	NA
Photoionization detector (PID)	Total volatile Organic compounds, and specific Organics, as applicable	daily, before and after sampling
Sound level meter, Noise dosimeter	Noise	before and after use

TABLE 10-2

CHEMICAL PERMISSIBLE EXPOSURE LIMITS[1] AND LEVEL C ACTION LEVELS*

CHEMICAL	8-HOUR PEL/TLV	ACTION LEVEL FOR LEVEL C
Hydrogen Cyanide	5 (STEL)	2.5
Hydrogen Sulfide	14	7.0[3]
Tetrachloroethene	170	85
2-Butanone (Methyl Ethyl Ketone)	590	295
Total volatile Organic Compounds (as isobutylene)[2]	---	1-5 ppm[4]
Total Dust	10	5
Respirable Dust (as Quartz)	0.1	0.05
Arsenic	0.2	0.1
Cadmium	0.05	0.025
Chromium	0.5	0.25
Nickel	0.1	0.05
Silver	0.01	0.005
Lead	0.05	0.025

---

* All concentrations in milligrams per cubic meter (mg/m^3) unless otherwise indicated.

[1] PELs from OSHA 1910.1000; TLVs from ACGIH "Threshold Limit Values and Biological Exposure Indices for 1991-1992.

[2] Calibrated for isobutylene (or other organic vapor as identified by EG&G).

[3] Exposure above action levels are not anticipated; however, Level B protection will be utilized if action level contamination concentrations occur.

[4] At levels 1-5 ppm, above background levels, in breathing zone, stop work and re-evaluate.

TABLE 10-3

RADIATION CONTAMINATION CONTROL LIMITS

TABLE I: ALPHA LIMITS			
Area	Removable		Total Fixed Plus Removable ($dpm/100cm^2$)
	Smears ($dpm/100cm^2$)	Swipes (dpm)	
Uncontrolled	20	N/A	300[2]
Controlled	20	N/A	300[2]
Radiological	200	500[1]	3000[2]

TABLE II: BETA/GAMMA LIMITS		
Area	Removable Smear ($dpm/100cm^2$)	Total Fixed Plus Removable ($dpm/100cm^2$)
Uncontrolled	200	5,000[3]
Controlled	200	5,000[3]
Radiological	1,000	5,000[3]

[1] Minimum detectable activity using the Ludlum Model 12-1A with air proportional detector. Total Efficiency (instrument and detector) is 50%. 250 cpm equals 500 dpm. No activity per area is specified since swipes are not used to quantify activity levels.

[2] 300 $dpm/100cm^2$ is the DOE limit for Uncontrolled and Controlled Areas. 3000 $dpm/100\ cm^2$ is the DOE limit for Radiological areas. The minimum detectable activity using the Ludlum Model 12-1A with air proportional detector of approximately 50 cm^2 is 1000 $dpm/100\ cm^2$ which corresponds to a 250 cpm instrument meter reading.

[3] 5000 $dpm/100\ cm^2$ is the DOE limit for Uncontrolled and Controlled Areas and is the Rocky Flats limit for Radiological Areas. The minimum detectable activity (MDA) using the Ludlum Model 31 rate meter with the 44-9 pancake GM detector is 5000 $dpm/100\ cm^2$. This corresponds to a meter reading of 200 cpm. The maximum allowed background for this MDA is 100 cpm with the instrument range switch on the X1 setting.

Source: RADIOLOGICAL OPERATING INSTRUCTIONS: Performance of Surface Contamination Surveys. ROI 3.1, Page 17 of 24, December 6, 1990.

TABLE 10-4

RADIONUCLIDE DERIVED AIR CONCENTRATION LIMITS FOR OCCUPATIONAL WORKERS

	DAC, UCI/mL
Americum 241	2×10^{-12}
Plutonium 239	2×10^{-12}
Uranium 233	2×10^{-11}
Uranium 234	2×10^{-11}
Uranium 238	2×10^{-11}

Source: U.S. Department of Energy, Derived Air Concentrations (DAC) for Controlling Radiation Exposure to Workers at DOE Facilities, DOE-5480.11, Issued 12/21/88.

10.3.4 PERSONAL DOSIMETRY

Radiation monitoring will be provided by EG&G. This includes external and internal dosimetry.

10.3.4.1 EXTERNAL DOSIMETRY

HNUS workers with regular duties at the worksite will be assigned a radiation dosimeter by EG&G. The dosimeter will be specifically assigned to an individual. A dosimeter with a picture identification will be provided for workers who are on-site on a regular basis. An annual report of personal radiation exposure will be provided by EG&G to HNUS and will be made available to the individual. Visitors to controlled areas will receive a non-picture dosimeter from EG&G. Guidelines for the use and handling of dosimeters are shown on Table 10-5.

TABLE 10-5

GUIDELINES FOR THE USE AND HANDLING OF DOSIMETERS

- Dosimeters must be worn on the front upper torso of the body
- Dosimeters are not allowed to exit the plantsite
- Dosimeters are to be stored on the designated storage board when not in use
- Dosimeters must be handled with care and not dropped or mistreated in any manner
- Dosimeters shall not be allowed to traverse through X-Ray screening devices as this will artificially elevate the dosimeter readout
- Plastic cards, keys, or other objects shall not be worn directly in front or behind the dosimeter badge
- Dosimeters must be returned to the Dosimetry Laboratory in building 123, or left with your supervisor at the end of your work at the Rocky Flats Plant

10.3.4.2 INTERNAL DOSIMETRY

HNUS personnel will be required to submit a bioassay sample before and after the processing phase of the project. Individuals involved in radiation contamination incidents (skin and/or wound contamination and possible inhalations) may be required to undergo additional testing and sampling per EG&G procedures as indicated on Attachment 10-6. The Radiological Protection Incident Report Form RF-46988 will be completed, along with the Radiological Deficiency Report (RDR), after each incident, and provided to EG&G and HNUS. EG&G will provide this service to HNUS.

RADIOLOGICAL PROTECTION INCIDENT REPORT

BLDG	DATE (MM D D Y Y)	TIME	AREA

RADIOLOGICAL PROTECTION INCIDENT REPORT

(PERSONNEL CONTAMINATION, WOUND COUNTS, POSSIBLE INHALATIONS)

(Type or print neatly in BLACK ink. Instructions, room for comments on back)

Employee - Last Name, Int. (print)			Employee #	Organization	Supervisors Name *(print)*
Survey Instrument			Serial #		Date Cal./Source Checked
Sent to Medical/ Int. Dosimetry		Wound Description		Respiratory Protection	Representative Sample (dpm)
At Hours For		Laceration		None	Nasal Swab/Blow: Yes / No
Wound Count		Puncture		Half Mask	Type of Material Involved
Body Count		Abrasion		Full Face Mask	(Pu, Am, etc.)
Decontamination		Burn		Supplied Air	(oxide, metal, etc.)

MARK INITIAL AND RESIDUAL SKIN CONTAMINATION LEVELS OUTSIDE OF BODY DIAGRAM.

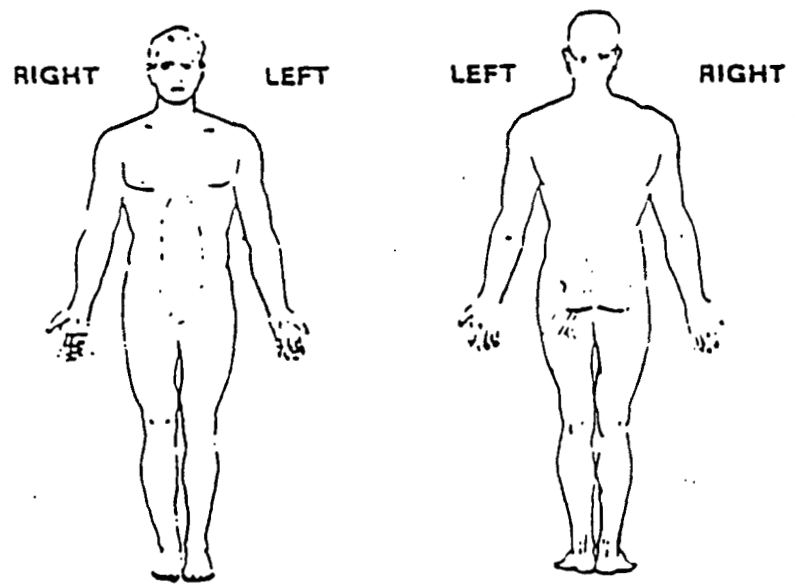
USE ARROWS TO INDICATE EXACT LOCATION OF CONTAMINATION ON BODY.

MARK LOCATION OF WOUND WITH (X) ON BODY DIAGRAM.

CIRCLE RESIDUAL LEVELS OF CONTAMINATION.

DECONTAMINATION COMPLETED IN BUILDING?

YES_____ NO_____



Reported By (print below)	(sign below)	Employee #	Date (mm.dd.yy)
RPT			
RO SUPERVISOR			

RF-46988 (Rev. 12/90) Destroy Previous Issues

Figure 10-6
Radiological Protection Incident Report

SECTION 11.0 TRAINING

11.1 INTRODUCTION

All field personnel are required to have completed as a minimum: a 24 or 40-Hour OSHA 29 CFR 1910.120 health and safety course and appropriate annual 8-Hour health and Safety refresher training.The specific training required for a site worker will be dependent on the following work activities or location:

- Working within the established site control zones for the Solar Ponds in level "D", (24 hour).
- Working within the established site control zones for the Solar Ponds while wearing a respirator/level "C" (40 hour)
- Working outside the established site control zones for the Solar Ponds, in support of treatment operations, regardless of respiratory protection (24 hour).

Tables 11-1 and 11-2 summarize the training requirements in OSHA 29 CFR 1910.120 for work within the Solar Pond site control zones, and for work on the treatment operations. EG&G subcontractors will receive a variety of training from EG&G Rocky Flats in specific operations and related health and safety at the Rocky Flats Plant per the guidelines on Figure 11-1.

TABLE 11-1
TRAINING REQUIREMENTS FOR SOLAR POND SITE CONTROL ZONES

Operation/Personnel	Site Safety Briefing	24-Hr	40-Hr	8-Hour Supervisor	8-Hour Refresher
• Routine or Occasional Site Worker	Yes	Yes[3]	Yes	N/A	Yes
• Routine or Occasional Site Worker (Support Zone)	Yes	N/A	N/A	N/A	N/A
• On-Site Supervisor	Yes	Yes[4]	Yes	Yes	Yes
• Visitor[1,2] • Level A or B PPE	Yes	N/A	Yes	N/A	Yes
• Level C PPE	Yes	Yes	N/A	N/A	Yes
• Level D or No PPE	Yes	N/A	N/A	N/A	N/A

[1] = All visitors should be issued and instructed in the use of required personal protective equipment (PPE), receive a site-specific safety briefing, and be escorted by training personnel.

[2] = Visitors are not directly involved with hazardous waste operations (e.g., management, audit, and oversight personnel). Visitors include those covered and not covered by OSHA.

[3] = 24-hour training is adequate for these workers only for entry into areas where Level D PPE is sufficient. For routine workers, area must also have been monitored and fully characterized.

[4] = Supervisors of general site workers who require only the 24-hour course need only take the 24-hour initial and 8-hour supervisor courses.

TABLE 11-2
TRAINING REQUIREMENTS FOR
TREATMENT AT SOLAR PONDS AREA FACILITIES

Operation/Personnel	Site Safety Briefing	24-Hour	40-Hour	8-Hour Supervisor	8-Hour Refresher
• General Site Worker	Yes	Yes	N/A	N/A	Yes
• Supervisor	Yes	Yes	N/A	N/A	Yes
• Visitor[1,2]	Yes	N/A	N/A	N/A	N/A

[1] = All visitors should be issued and instructed in the use of required personal protective equipment (PPE), receive a site-specific safety briefing, and be escorted by trained personnel.

[2] = Visitors are not directly involved with hazardous waste operations (e.g., management, audit, and oversight personnel). Visitors include those covered and not covered by OSHA.

11.2 SUPERVISED FIELD EXPERIENCE

The type of field experience required is based on the type or initial training obtained.

- 40 Hour OSHA trained needs 3 days field experience documentation.
- 24 Hour OSHA trained for work within the Solar Pond Site Control Zones needs 1 day field experience, documentation.
- 24 Hour OSHA trained for work related to treatment operations, does not require field experience documentation.

11.3 RADIATION WORKERS' TRAINING

As required by DOE Order 5480.11, a course designed to improve the understanding, implementation and practice of standard industry radiation safety procedures is required for radiation workers, including subcontractors working with low-level mixed waste. EG&G provides this course to train workers in the use of protective clothing and decontamination procedures for equipment.

11.4 HAZARD COMMUNICATION TRAINING

Workers handling chemical materials will receive hazard communication training.

11.5 EMERGENCY RESPONSE TRAINING

Training of emergency response personnel is only applicable to those individuals responsible for true emergency response. Emergency response is defined by OSHA as a "coordinated response effort . . . to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance" (29 CFR 1910.120). Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate area, are not considered emergency response efforts. EG&G Rocky Flats will provide Emergency Response personnel in the event that it becomes necessary.

11.6 TASK TRAINING & RELATED HEALTH & SAFETY TRAINING

EG&G and HNUS provides specific task training to field operators and site workers on the basis of their responsibilities. Figure 11-1 lists the general courses for site personnel. In addition, the Site Health & Safety Plan, OSAs, JSAs, and engineering/ operations manuals will be utilized for field training. This is sometimes accomplished through a "pre-evolution" meeting at the beginning of the work shift. The form in Figure 11-2 will be used to document HNUS HASP orientation.

11.7 DOCUMENTATION

Records will be maintained for all health and safety training programs attended by site personnel at the HNUS project office. EG&G will also have a record of on-site courses attended by subcontractors working on the Solar Ponds Project.

HALLIBURTON NUS TRAINING GUIDELINES-SOLAR PONDS PERSONNEL													
	OSHA * TRAINING	PHYSICIAN * STMT	BLDG INDOC	RCRA CBT	RCRA OJT	RESP INDOC	RAD WORKER	GET-SUB CONTRACTOR	LO/TO BRIEFING	SITE SAFETY BRIEFING	DOSIMETER ORIENT	HAZ COMM	HEARING CONSV
Category A Visitors/Observ			X							X	X		
Category B Tech Oversight	X	X	X							X	X		
Category C Engineers & Construction	X	X	X					X	X	X	X	X	X
Category D Project Supervisor	X	X	X	X	X	X	X	X	X	X	X	X	X
Category E Operations Maintenance	X	X	X	X	X	X	X	X	X	X	X	X	X

* Training and statement to be provided by HNUS or Subcontractors.

Figure 11-1
HALLIBURTON NUS SOLAR PONDS PERSONNEL HEALTH & SAFETY TRAINING GUIDELINES

DOCUMENTATION FORM FOR HEALTH & SAFETY PLAN ORIENTATION

SITE: EG&G Rocky Flats Plant
Golden, Colorado

PROJECT: Solar Ponds Waste Processing

I have received training on, or read, the Health & Safety Plan for the Solar Ponds Area, and understand and agree with the information that is set forth in this Health & Safety Plan (plus attachments). I also understand that the Health & Safety Plan is available for review and reference throughout the project duration.

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date

Verified By:_____ DATE:_____
Trainer

Figure 11-2
DOCUMENTATION FORM FOR HEALTH & SAFETY PLAN ORIENTATION

SECTION 12.0 NEW TECHNOLOGIES

12.1 INTRODUCTION

OSHA requires that the operator of treatment, storage and disposal (TSD) facilities develop and implement procedures for the introduction of "effective new technologies and equipment developed for the protection of employees" [29 CFR 1910.120(o)]. New products and techniques must be evaluated by employers before they are implemented on a large scale.

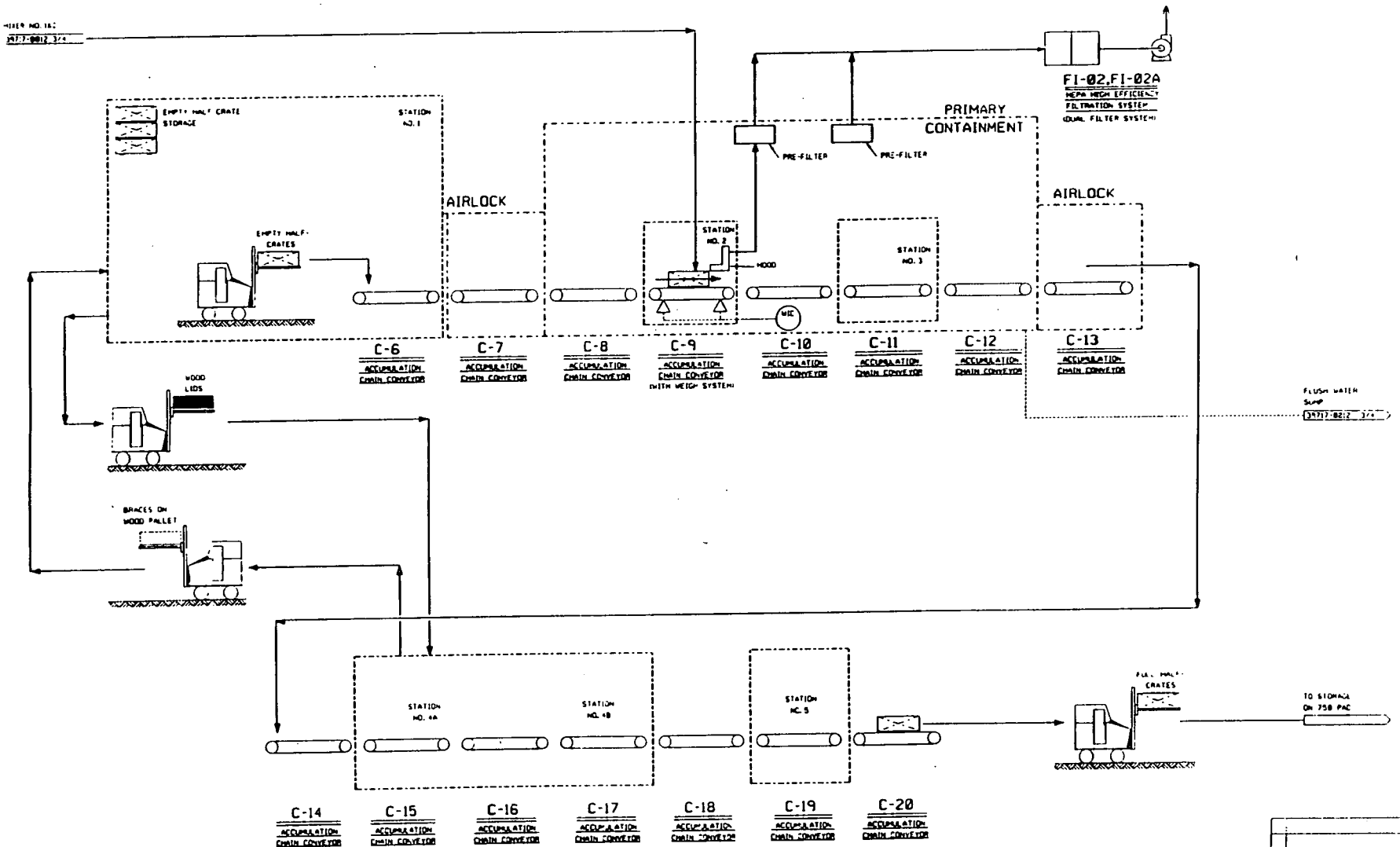
12.2 PROGRAM IMPLEMENTATION

EG&G has an extensive health, safety and environmental protection program made up of multiple departments with specific areas of expertise. A representative from each of the health and safety divisions is assigned responsibility for the SEP site. Each representative is responsible for providing a safe work environment by actively seeking ways to improve safety at the site. Each department (i.e., Occupational Safety, Industrial Hygiene, Radiological Engineering) participates in national conferences and seminars in which products and technology are demonstrated and studies of effectiveness are reviewed. Vendors of health and safety equipment are encouraged to present new products to the appropriate department representatives. In addition, EG&G is active in the research and development of new products and technologies through specific government contracts.

Furthermore, EG&G is utilizing the services of HALLIBURTON NUS, a world leader in cement technology, to stabilize mixed waste from the SEPs. In addition, HNUS is using subcontractors with specialized expertise germane to the SEP project. This project requires the use of high volume grout mixing and pumping technology; development of statistically-based process control; and on-site installation of a fully-equipped mixed waste laboratory. All waste will be treated to remove hazardous waste characteristics as measured by the TCLP (Toxicity Characteristic Leaching Procedure) test to create a waste form that is acceptable for transportation to, and disposal at the Nevada Test Site. This project, which may chart the course for similar high volume DOE mixed waste stabilization projects, emphasizes waste sampling and analysis, quality assurance, equipment selection and process control. It is the largest mixed waste stabilization project ever undertaken. Engineering controls are described in Section 6.2.

12.3 METHODS OF EVALUATION

OSHA requires that efforts in the area of new product and technology evaluation be documented and made available to the OSHA inspector upon request. Table 12-1 lists the Departments which are responsible for evaluation of specific products and technologies. The listed EG&G departments will develop and maintain new products and technologies associated with the SEP stabilization project.



NOTES:
1. ALL EQUIPMENT ITEM NUMBERS ON THIS DRAWING HAVE A "B" PREFIX.
2. STPH = SHORT TONS PER HOUR
3. THIS DRAWING SHOWS HATCH CERTIFICATION INSTRUMENTS ONLY.
4. STATION DESIGNATION:
   - *1 EMPTY HALF CRATE STORAGE AND ASSEMBLY
   - *2 PACKING AND INSPECTION
   - *3 BAG CLOSURE AND INSPECTION
   - *4 CRATE CLOSURE AND INSPECTION
     - *4A INSTALL LID
     - *4B INSTALL BANDING
   - *5 RADIOLOGICAL SURVEY

DESCRIPTION	STRM NO. UNITS
TAL FLOW	STPH
IDS FLOW	STPH
ANT FLOW	STPH
TAL FLOW	GPM
IDS WT%	WT%
IDS S.G.	-
ANT. S.G.	-

1	CLIENT APPROVAL
0	OFFICE CHECK

KEYWORDS
1. SOLAR PONDS
2. STABILIZATION
3. POND 207 A&B
4. FLOW DIAGRAM
5. SAMPLING STATION

1	CLIENT APPROVAL		
0	OFFICE CHECK		

DESCRIPTION	BY	DATE
DESIGNED	GMB	03/13/92
DRAWN	RJLEACH	03/13/92
CHECKED	GB	03/13/92

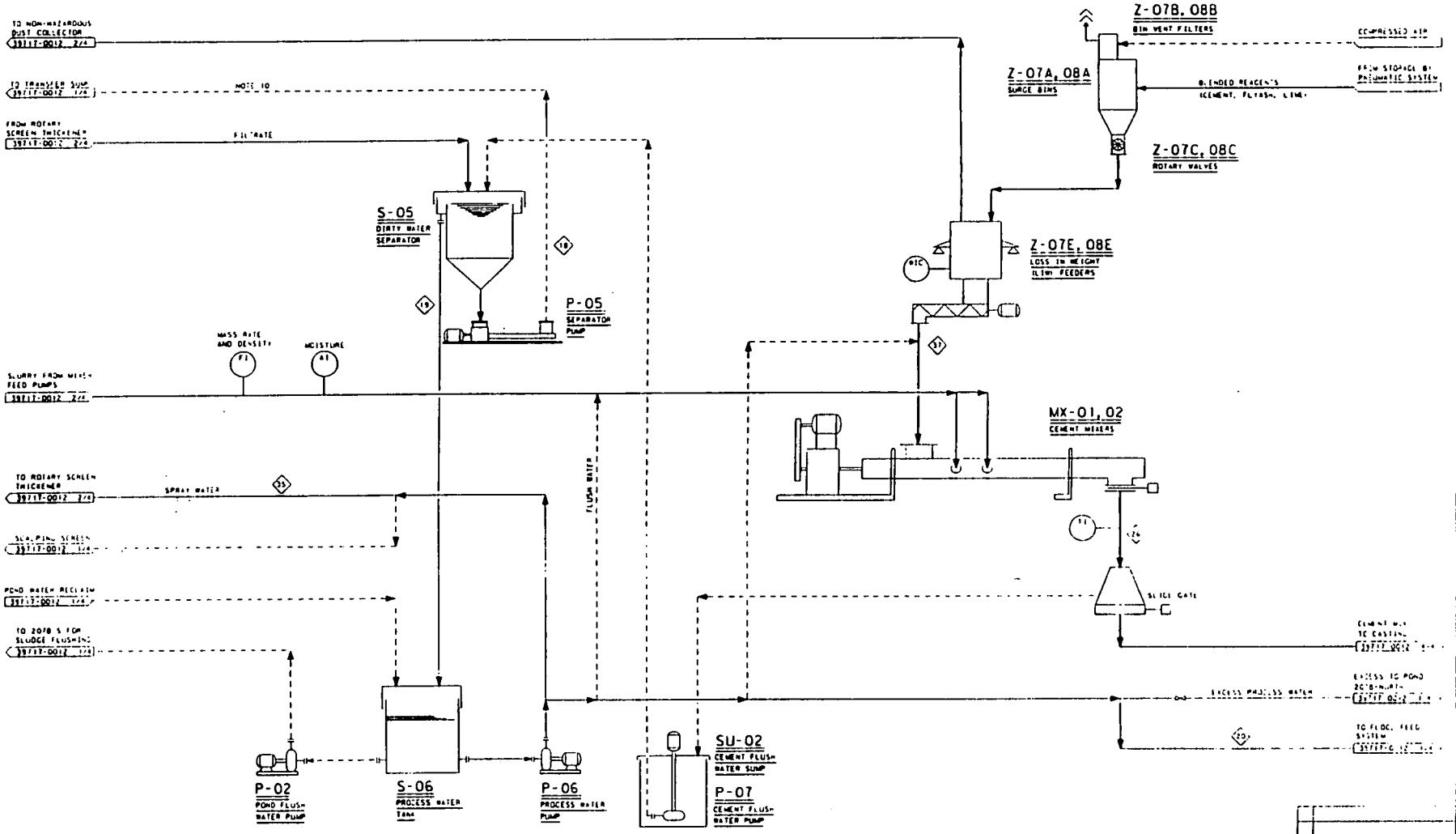
HALLIBURTON NUS Environmental Corporation

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS PLANT
GOLDEN, COLORADO

SOLAR POND/CONCRETE STABILIZATION PAD
POND SLUDGE PROCESS FLOW DIAGRAM
POND 207 A&B CASK WASH STATION

DI 39717-2012 11

COMPUTER GENERATED



NOTES:

1. ALL EQUIPMENT ITEM NUMBERS ON THIS DRAWING HAVE "ASC" PREFIX.
2. PIPING WITHIN SECONDARY CONTAINMENT WILL BE SINGLE WALL - OTHERWISE DOUBLE-WALL.
3. - - - DENOTES INTERMITTENT OR OPTIONAL FLOWS.
4. STM - SHORT TONS PER HOUR.
5. THIS DWG SHOWS MAJOR PROCESS INSTRUMENTS ONLY.
6. ALL FLOWS ARE FOR TREATING THE CONSOLIDATED CONTENTS OF 2078 & 2078 PONDS.
7. SECONDARY CONTAINMENT DETAILS WILL BE SHOWN ON P&IC 5.
8. DILUTION WATER TO POND 2/C NOT SHOWN.
9. MATERIAL BALANCES ARE BASED ON 32 SOLIDS FEED FROM POND 2078-S AND 20% SOLIDS FEED TO CEMENTATION. (REF. MATERIAL BALANCES FOR PONDS 2078/B PROCESSING ISSUE) 5.
10. INTERMITTENT FLOW MATL. BALAN REFLECTS CONT. OPN. FLOW

NOTE: 4, 9

DESCRIPTION	STRM NO.	18	19	20	26	35	37
STM. FLOW	S*PH	0.18	10.34	0.76	7.50	3.56	4.92
SOLIDS FLOW	S*PH	0.03	-	0.02	5.43	0.00	4.92
LIQUID FLOW	S*PH	0.15	10.34	0.76	2.07	3.56	0.00
STM. FLOW	GPM	0.70	40.72	3.02	15.5	14.00	-
SOLIDS WT%	WT%	5.01	0.00	0.02	72.46	0.00	100.00
SOLIDS S. G.	-	1.57	-	-	2.76	-	2.87
LIQUID S. G.	-	1.10	1.02	1.02	1.93	1.02	-

7	CLIENT APPROVAL	04/27/92
6	CLIENT APPROVAL	04/15/92
5	CLIENT APPROVAL	03/30/92

KEY-DRDS

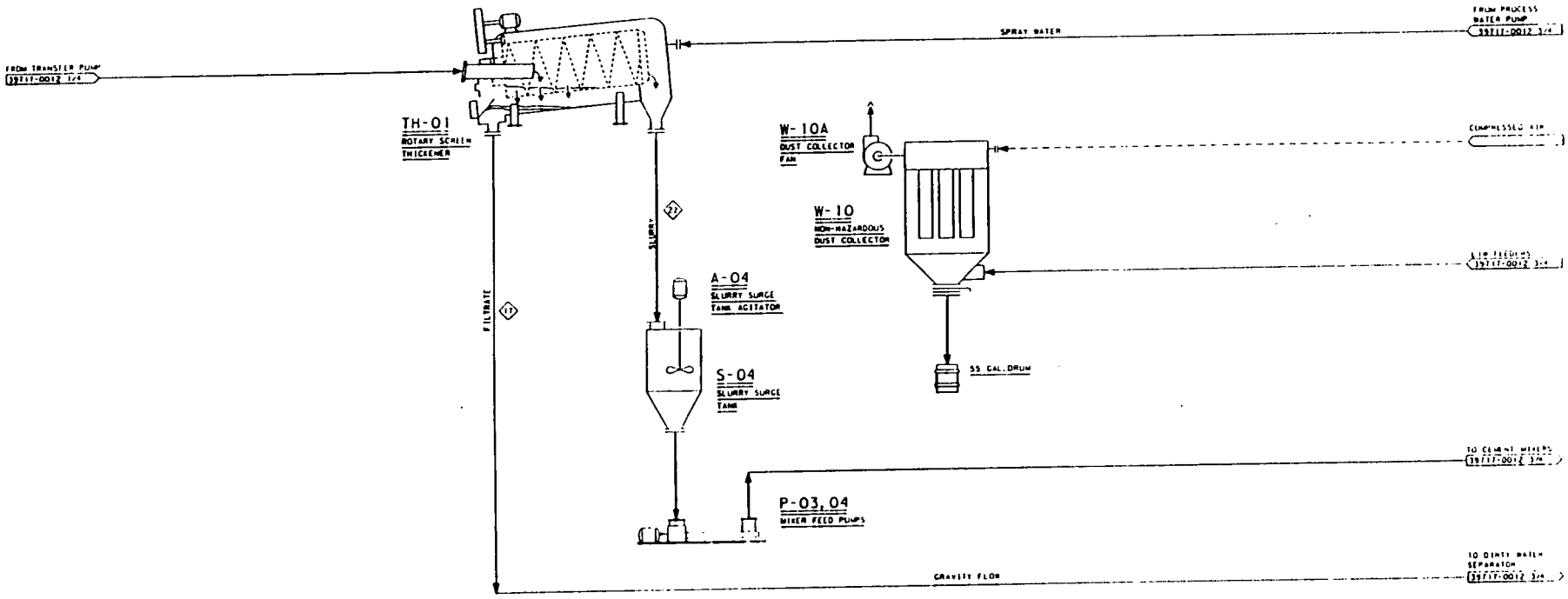
HALLIBURTON NUS Environmental Corporation

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant

SOLAR PONDS WASTE STORAGE, PUMP SLUDGE PROCESS FLOW DIAGRAM PONDS 207A/B CEMENT MIXING AND CASTING

17-00



NOTES:

1. ALL EQUIPMENT ITEM NUMBERS ON THIS DRAWING HAVE "43C" PREFIX.
2. PIPING WITHIN SECONDARY CONTAINMENT WILL BE SINGLE WALL, OTHERWISE DOUBLE-WALL.
3. — — — DENOTES INTERMITTENT OR OPTIONAL FLOWS
4. STPH - SHORT TONS PER HOUR
5. THIS DRW SHOWS MAJOR/CRITICAL INSTRUMENTS ONLY.
6. ALL FLOWS ARE FOR TREATING THE CONSOLIDATED CONTENTS OF 207A & 207B PONDS.
7. SECONDARY CONTAINMENT DETAILS WILL BE SHOWN ON PAID 5.
8. DILUTION WATER TO PUMP 207C NOT SHOWN.
9. MATERIAL BALANCES ARE BASED ON 3% SOLIDS FEED FROM POND 207B-S AND 20% SOLIDS FEED TO CEMENTATION. REF.: MATERIAL BALANCES FOR PONDS 207A/B PROCESSING ISSUED 6, REV. 0.

(1) INTERMITTENT FLOW MASS BALANCE REFLECTS CONT. AVG. FLOW

NOTE: 4, 9

DESCRIPTION	STRM NO. / UNITS	(1)	(2)
TOTAL FLOW	STPH	10.52	2.58
SOLIDS FLOW	STPH	0.03	0.52
LIQUID FLOW	STPH	10.49	2.06
TOTAL FLOW	GPM	41.40	8.16
SOLIDS WTZ	WTZ	0.26	20.0
SOLIDS S. G.	-	1.57	1.57
SLURRY S. G.	-	1.02	1.13

7	CLIENT APPROVAL	DRB	WCH	MM
6	CLIENT APPROVAL			
5	CLIENT APPROVAL			

7	CLIENT APPROVAL		04/27/92
6	CLIENT APPROVAL		04/15/92
5	CLIENT APPROVAL		03/30/92

KEYWORDS
1. POND SLUDGE
2. ROTARY PRESS
3. STABILIZATION
4. DEWATERING
5. FLOW DIAGRAM

DESIGNED	DRB	03-13-92	
DRAWN	ALBERT	03-30-92	
CHECKED	WCH	04-24-92	
APPROVED	MM		

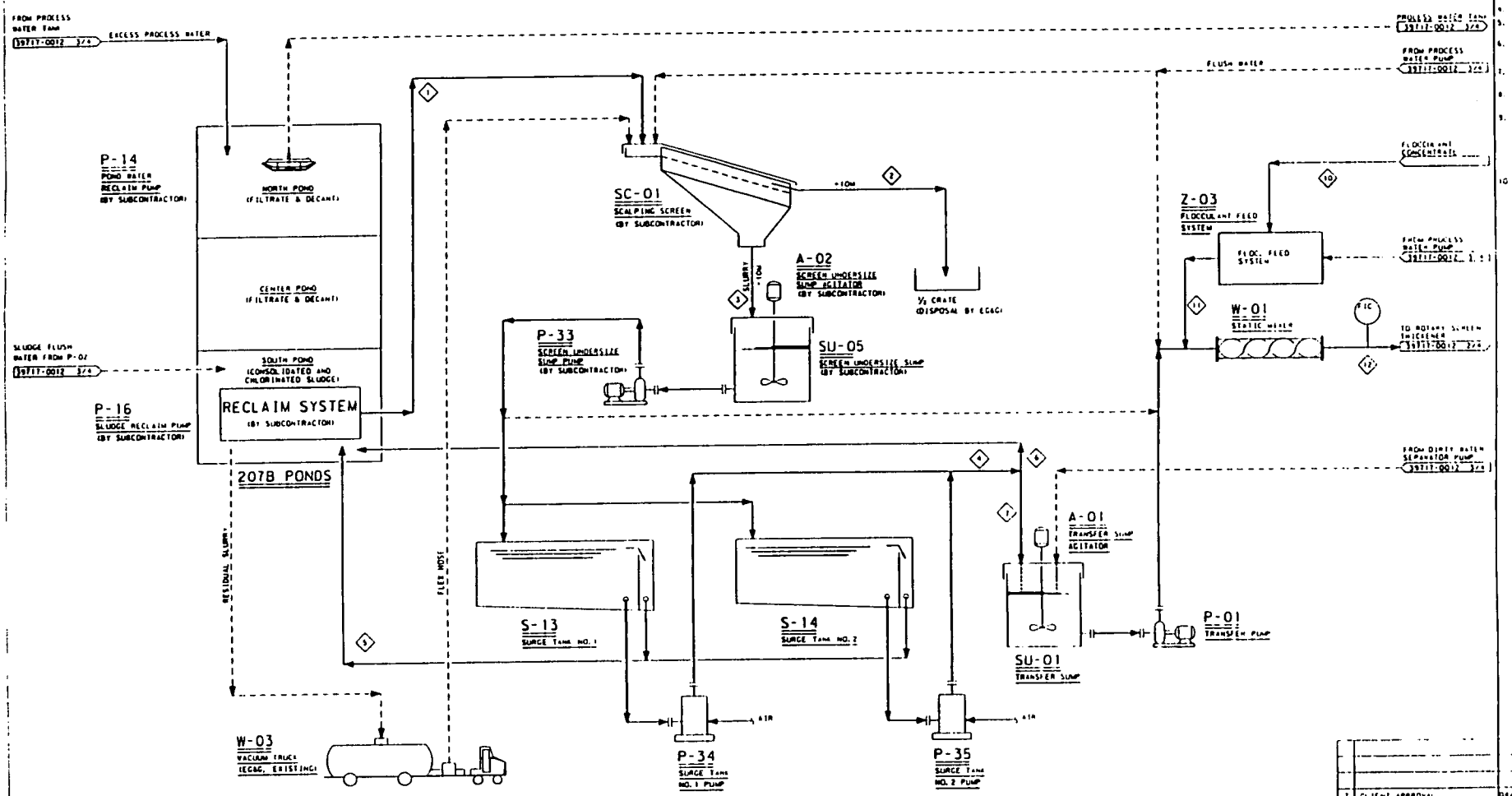
HALLIBURTON NUS Environmental Corporation

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE
Rocky Flats Plant
GOLDEN, COLORADO

SOLAR POND/CONCRETE STABILIZATION PROJ.
POND SLUDGE - PROCESS FLOW DIAGRAM
PONDS 207 A&B CONDITIONING AND DEWATERIN

SIZE D | 3971 .012 | 7 | 2 • 4

COMPUTER GENERATED
NO MANUAL CHANGES ALLOWED



NOTES:

1. ALL EQUIPMENT ITEM NUMBERS ON THIS DRAWING HAVE "A10" PREFIX
2. PIPING WITHIN SECONDARY CONTAINMENT WILL BE SINGLE WALL, OTHERWISE DOUBLE-WALL.
3. — — — DENOTES INTERMITTENT OR OPTIONAL FLOWS
4. STPH - SHORT TONS PER HOUR
5. THIS DWG SHOWS PRELIMINARY PROCESS CONTROL CONCEPTS ONLY.
6. ALL FLOWS ARE FOR TREATING THE CONSOLIDATED CONTENTS FROM PONDS 207A & 207B
7. SECONDARY CONTAINMENT DETAILS WILL BE SHOWN ON P&ID'S.
8. DILUTION WATER TO POND 207C NOT SHOWN.
9. MATERIAL BALANCES ARE BASED ON 32 SOLIDS FEED FROM POND 207B-S AND 20% SOLIDS FEED TO CEMENTATION. REF. MATERIAL BALANCES FOR P&IDS 207A/B PROCESSING ISSUE, N, REV. 1.
10. INTERMITTENT FLOW MASS BALANCE REFLECTS CONT. AVG. FLOW

NOTE: 4, 9

DESCRIPTION	STRM NO. / UNITS	①	②	③	④	⑤	⑥	⑦	⑧	⑩	⑪	⑫
TOTAL FLOW	STPH	20.66	0.008	20.65	10.28	10.37	1.67	8.61	8.79	0.0015	0.76	9.55
SOLIDS FLOW	STPH	0.62	0.003	0.62	0.62	0.00	0.10	0.52	0.54	0.0015	0.00	0.54
LIQUID FLOW	STPH	20.04	0.005	20.03	9.66	10.37	1.57	8.09	8.25	0.00	0.76	9.01
TOTAL FLOW	GPM	80.00	0.03	80.00	39.20	40.80	6.37	32.80	33.50	-	3.00	36.50
SOLIDS WT%	WT%	3.00	38.27	2.99	6.00	0.00	6.00	6.00	6.19	100.00	0.00	5.69
SOLIDS S. G.	-	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	-	-	1.57
SLURRY S. G.	-	1.03	1.23	1.03	1.05	1.02	1.05	1.05	1.05	-	1.02	1.05

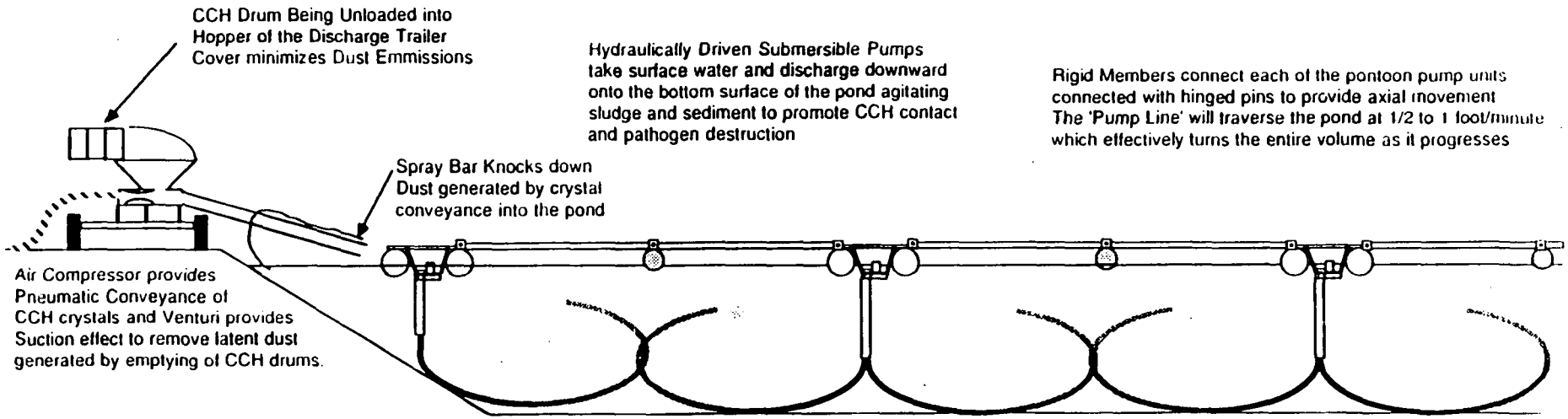
7	CLIENT APPROVAL	04/27/92
6	CLIENT APPROVAL	04/15/92
5	CLIENT APPROVAL	03/30/92

KEYWORDS
1. POND SLUDGE
2. POND SLUDGE
3. STABILIZATION
4. RECLAIM
5. FLOW DIAGRAM

HALLIBURTON NUS Environmental Corporation

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE
GOLDEN, COLORADO
Rocky Flats Plant
SOLAR POND/CONCRETE STABILIZATION
POND SLUDGE-PROCESS FLOW DIAGRAM
PONDS 207 AND SLUDGE RECLAIM SYSTEM
SIZE D | 39717-001 | 7 | 1

COMPUTER GENERATED
NO MANUAL CHANGES ALLOWED

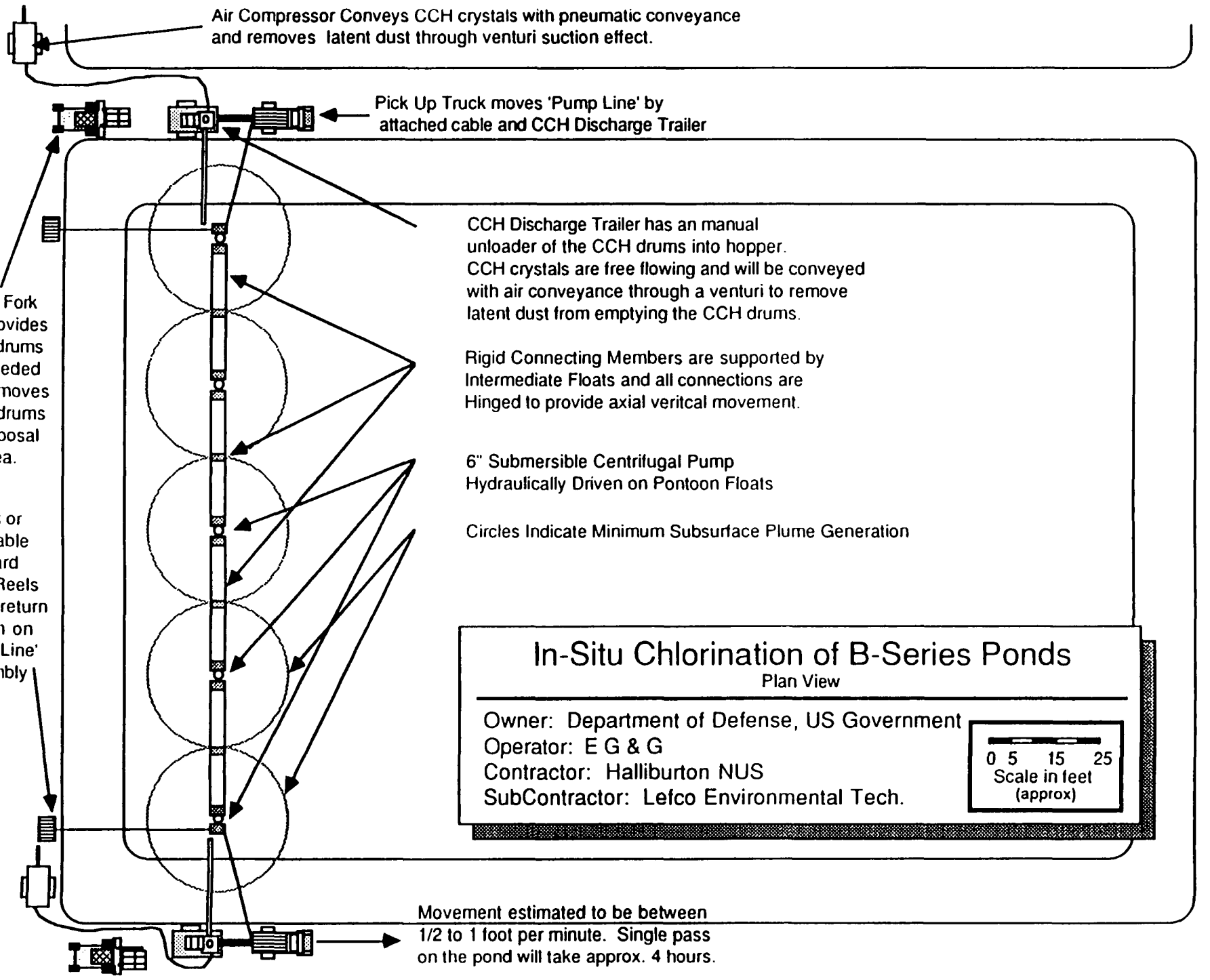


In-Situ Chlorination of B-Series Ponds

Owner: Department of Defense, US Government
Operator: E G & G
Contractor: Halliburton NUS
SubContractor: Lefco Environmental Tech.

Elevation View-Partial

0 1 2 3 4 5 6 7 8
Scale in feet
(approx)

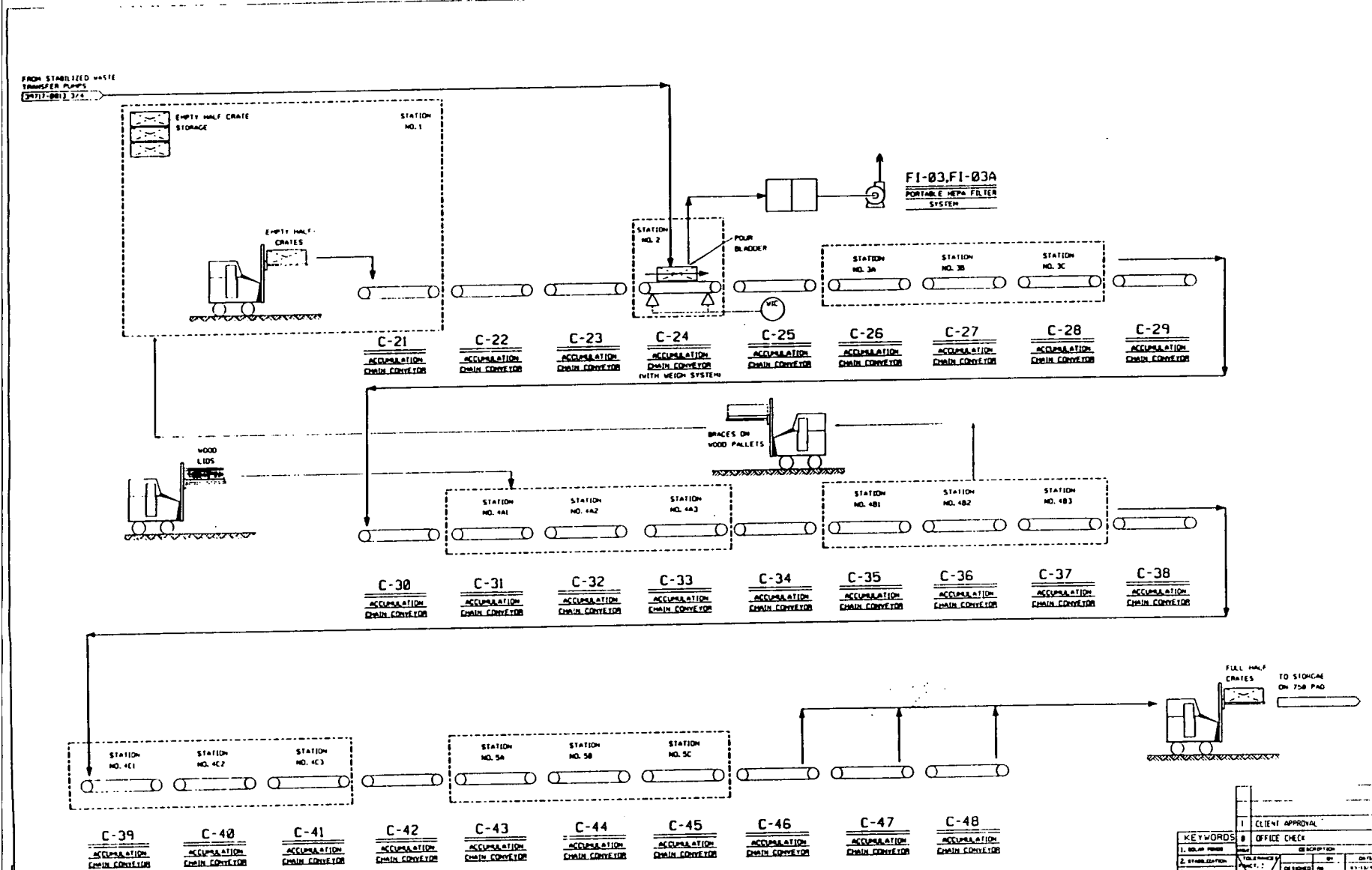


In-Situ Chlorination of B-Series Ponds

Plan View

Owner: Department of Defense, US Government
Operator: E G & G
Contractor: Halliburton NUS
SubContractor: Lefco Environmental Tech.

0 5 15 25
Scale in feet
(approx)



NOTES:

1. ALL EQUIPMENT ITEM NUMBERS ON THIS DRAWING HAVE "38" PREFIX.
2. STPH - SHORT TONS PER HOUR
3. THIS DRAWING SHOWS MAJOR/ CERTIFICATION INSTRUMENTS ONLY
4. STATION DESIGNATIONS:
   - *1 HALF CRATE ASSEMBLY AREA
   - *2 POURING AND INSPECTION STATION
   - *3 BAG CLOSURE AND INSPECTION STATION
   - *4 CRATE CLOSURE AND INSPECTION STATION
     - *4A LID INSTALLATION
     - *4B BRACE REMOVAL
     - *4C APPLY BANDING
   - *5 RADIOLOGICAL SURVEY STATION
5. EMPTY HALF CRATES RECEIVED WITH ALL INNER LINERS INSTALLED AND INSPECTED, READY FOR CASTING OF STABILIZED WASTES.

DESCRIPTION	STRM NO.
	UNITS
TOTAL FLOW	STPH
SOLIDS FLOW	STPH
LIQUID FLOW	STPH
TOTAL FLOW	GPM
SOLIDS WT%	WT%
SOLIDS S.G.	-
SLURRY S.G.	-

1	CLIENT APPROVAL	DRB	BR	HH
0	OFFICE CHECK			

HALLIBURTON NUS Environmental Corporation

1	CLIENT APPROVAL		JR 11/98
0	OFFICE CHECK		JR 11/98

KEYWORDS
1. SOLAR PONDS
2. STABILIZATION
3. 207C POND
4. FLOW DIAGRAM
5. CASTING STATION
6. FACILITY

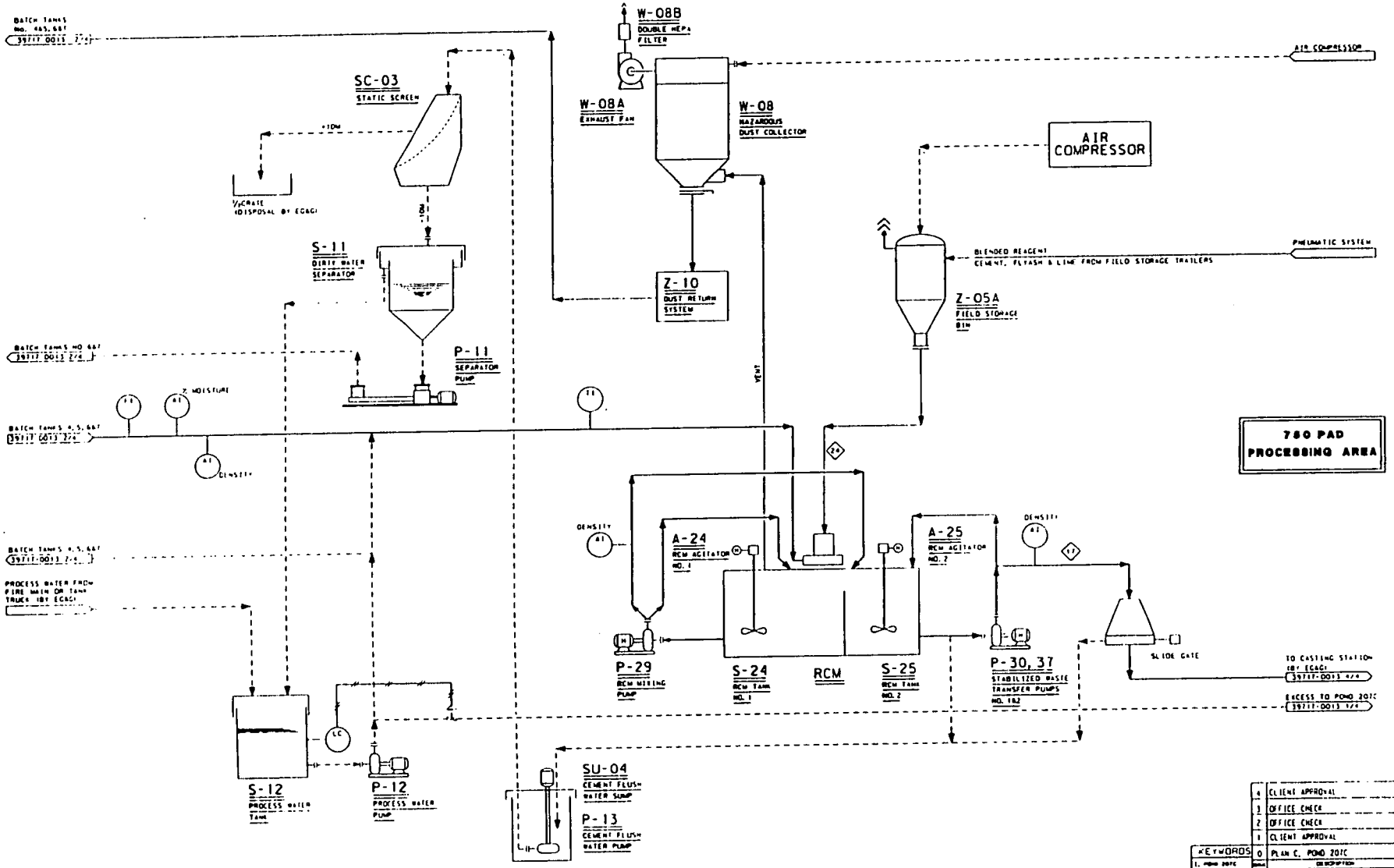
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE
ROCKY FLATS PLANT
GOLDEN, COLORADO

SOLAR POND/CONCRETE STABILIZATION PROJECT
POND SLUDGE PROCESS FLOW DIAGRAM
207C POND CASTING STATION

SIZE	DRAWING NUMBER	ISSUE	SHEET
D	39717-0013	1	4 of 4

SCALE: NONE

COMPUTER GENERATED
NO MANUAL CHANGES ALLOWED



NOTES:

1. ALL EQUIPMENT ITEM NUMBERS ON THIS DRAWING HAVE "-130" PREFIX.
2. PIPING WITHIN SECONDARY CONTAINMENT WILL BE SINGLE WALL, OTHERWISE DOUBLE-WALL.
3. — — — DENOTES INTERMITTENT OR OPTIONAL FLOWS.
4. STPH = SHORT TONS PER HOUR
5. THIS DWG SHOWS MAJOR/CERTIFICATION INSTRUMENTS ONLY.
6. ALL FLOWS ARE FOR TREATING THE DILUTED CONTENTS OF 207C POND AND T88 CLARIFIER.
7. SECONDARY CONTAINMENT NOT SHOWN. SEE P810'S.
10. MATERIAL BALANCE IS BASED UPON 10% SOLIDS FEED FROM POND 207C TO STABILIZATION. (REF. MATERIAL BALANCES FOR POND 207C, ISSUE 2, REV. 2)
11. H=HYDRAULIC POWERED

NOTE: 10

DESCRIPTION	STRM NO.	⟨1⟩	STRM NO.	⟨2⟩
	UNITS		UNITS	
TOTAL FLOW	STPH	14.0	STPH	8.63
SOLIDS FLOW	STPH	9.17	STPH	8.63
LIQUID FLOW	STPH	4.83	STPH	0.00
TOTAL FLOW	GPM	29.80	FT3/HR	12.80
SOLIDS WT%	WT%	65.50	WT%	100.00
SOLIDS S. G.	-	2.74	-	2.85
SLURRY S. G.	-	1.88	-	-

NO.	DESCRIPTION	BY	CHK'D	APP'D
4	CLIENT APPROVAL	DRB	BCH	MH
3	OFFICE CHECK			
2	OFFICE CHECK			
1	CLIENT APPROVAL			
0	PLAN C. POND 207C			

HALLIBURTON NUS
Environmental Corporation

NO.	DESCRIPTION	DATE
4	CLIENT APPROVAL	04/27/92
3	OFFICE CHECK	04/14/92
2	OFFICE CHECK	04/01/92
1	CLIENT APPROVAL	03/11/92
0	PLAN C. POND 207C	01-23-92

KEYWORDS
1. POND 207C
2. POND SLUDGE
3. STABILIZATION
4. CEMENT MIXER
5. FLOW DIAGRAM
6. DENSITY

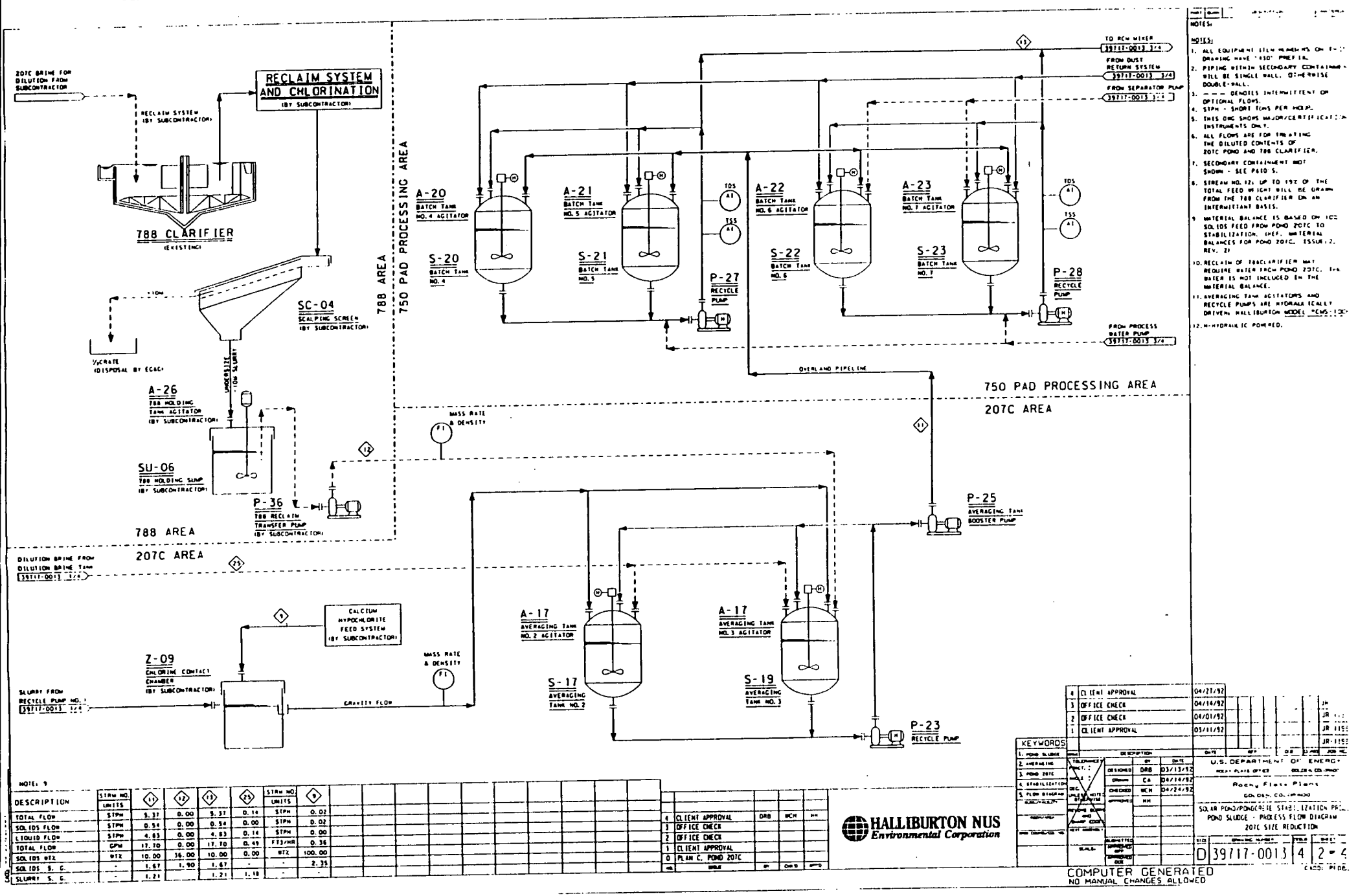
	DESIGNED	DRB	03/13/92
	DRAWN	CA	04/14/92
	CHECKED	BCH	04/29/92
	APPROVED	MH	

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS PLANT
GOLDEN, COLORADO

SOLAR POND/PONDCRETE STABILIZATION PROJ
POND SLUDGE PROCESS FLOW DIAGRAM
207C MIXING AND CASTING

SIZE D | 39717-0013 | SHEET 4 | 3 - 4

COMPUTER GENERATED
NO MANUAL CHANGES ALLOWED



NOTES:

1. ALL EQUIPMENT ITEM NUMBERS ON P-[illegible] DRAWING HAVE "150" PREFIX.
2. PIPING WITHIN SECONDARY CONTAINMENT WILL BE SINGLE WALL, OTHERWISE DOUBLE-WALL.
3. – – – DENOTES INTERMITTENT OR OPTIONAL FLOWS.
4. STPH - SHORT TONS PER HOUR.
5. THIS DWG SHOWS MAJOR/CRITICAL INSTRUMENTS ONLY.
6. ALL FLOWS ARE FOR TREATING THE DILUTED CONTENTS OF 207C POND AND 788 CLARIFIER.
7. SECONDARY CONTAINMENT NOT SHOWN - SEE P610 S.
8. STREAM NO. 12: UP TO 19% OF THE TOTAL FEED WEIGHT WILL BE DRAWN FROM THE 788 CLARIFIER ON AN INTERMITTANT BASIS.
9. MATERIAL BALANCE IS BASED ON 10% SOLIDS FEED FROM POND 207C TO STABILIZATION. (REF. MATERIAL BALANCES FOR POND 207C, ISSUE 2, REV. 2)
10. RECLAIM OF 788 CLARIFIER MAY REQUIRE WATER FROM POND 207C. THE WATER IS NOT INCLUDED IN THE MATERIAL BALANCE.
11. AVERAGING TANK AGITATORS AND RECYCLE PUMPS ARE HYDRAULICALLY DRIVEN; HALLIBURTON MODEL "EMS-[illegible]"
12. H=HYDRAULIC POWERED.

NOTE: 9

DESCRIPTION	STRM NO.	(11)	(12)	(13)	(25)	STRM NO.	(9)
	UNITS					UNITS	
TOTAL FLOW	STPH	5.37	0.00	5.37	0.14	STPH	0.02
SOLIDS FLOW	STPH	0.54	0.00	0.54	0.00	STPH	0.02
LIQUID FLOW	STPH	4.83	0.00	4.83	0.14	STPH	0.00
TOTAL FLOW	GPM	17.70	0.00	17.70	0.49	FT3/HR	0.36
SOLIDS WTX	WTX	10.00	36.00	10.00	0.00	WTX	100.00
SOLIDS S. G.	-	1.67	1.90	1.67	-	-	2.35
SLURRY S. G.	-	1.21		1.21	1.18	-	-

4	CLIENT APPROVAL	DRB	WCH	HH
3	OFFICE CHECK			
2	OFFICE CHECK			
1	CLIENT APPROVAL			
0	PLAN C. POND 207C			

4	CLIENT APPROVAL	04/27/92	
3	OFFICE CHECK	04/14/92	
2	OFFICE CHECK	04/01/92	
1	CLIENT APPROVAL	03/11/92	

KEYWORDS
1. POND SLUDGE
2. AVERAGING
3. POND 207C
4. STABILIZATION
5. FLOW DIAGRAM

	BY	DATE
DESIGNED	DRB	03/13/92
DRAWN	CA	04/14/92
CHECKED	WCH	04/24/92
APPROVED	HH	

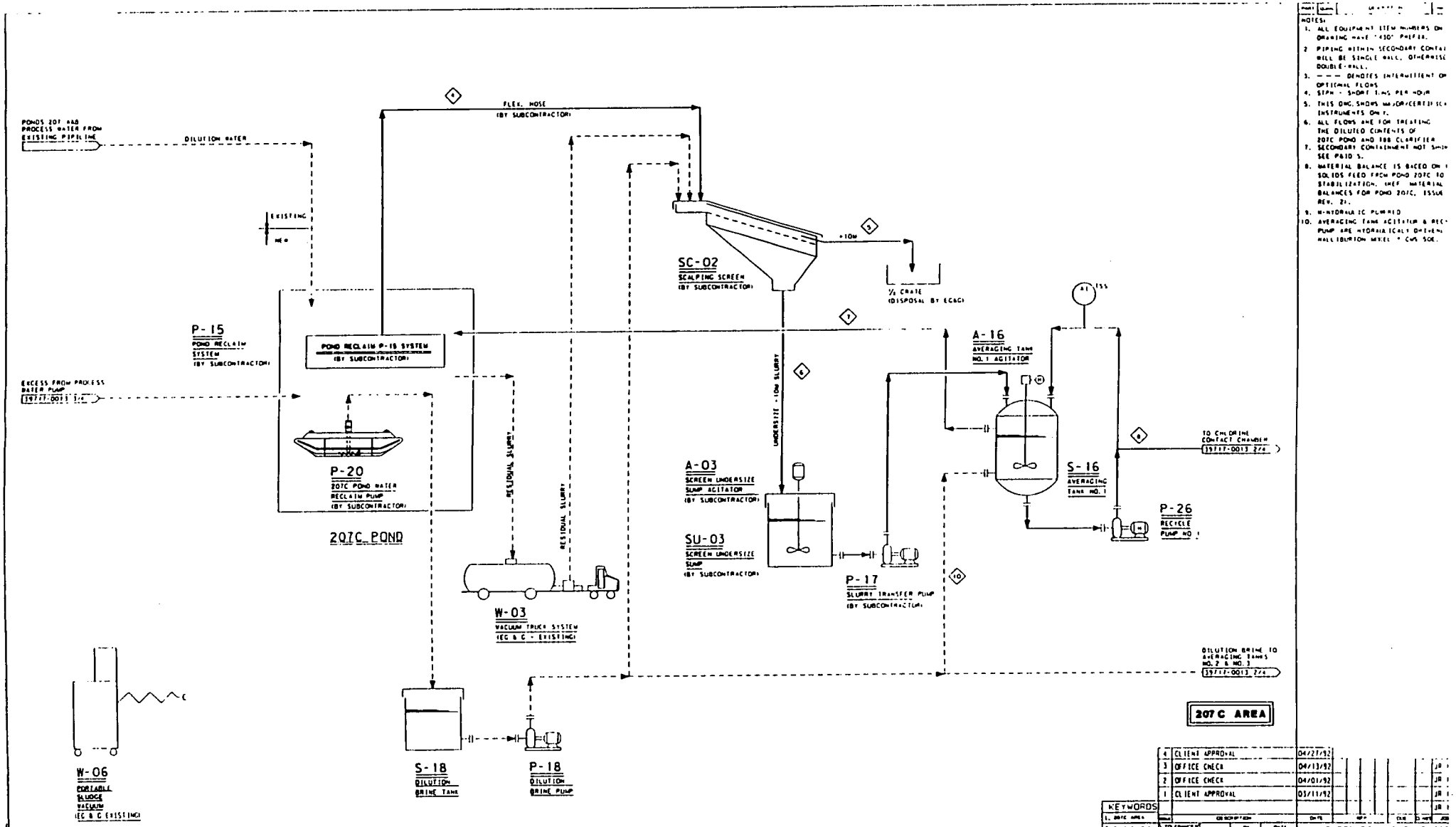
HALLIBURTON NUS Environmental Corporation

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE — GOLDEN, COLORADO
Rocky Flats Plant
GOLDEN, COLORADO

SOLAR POND/PONDCRETE STABILIZATION PROJ.
POND SLUDGE - PROCESS FLOW DIAGRAM
207C SIZE REDUCTION

SIZE D | DRAWING NUMBER 39717-0013 | REV 4 | SHEET 2 of 4

COMPUTER GENERATED
NO MANUAL CHANGES ALLOWED



NOTES:
1. ALL EQUIPMENT ITEM NUMBERS ON DRAWING HAVE "430" PREFIX.
2. PIPING WITHIN SECONDARY CONTAI WILL BE SINGLE WALL, OTHERWISE DOUBLE-WALL.
3. — — — DENOTES INTERMITTENT OR OPTIONAL FLOWS
4. STPH - SHORT TONS PER HOUR
5. THIS DWG. SHOWS MAJOR/CERTIFIC INSTRUMENTS ONLY.
6. ALL FLOWS ARE FOR TREATING THE DILUTED CONTENTS OF 207C POND AND IBB CLARIFIER
7. SECONDARY CONTAINMENT NOT SHO SEE P&ID 5.
8. MATERIAL BALANCE IS BASED ON SOLIDS FEED FROM POND 207C TO STABILIZATION. SHEET MATERIAL BALANCES FOR POND 207C, ISSUE REV. 2).
9. H-HYDRAULIC PUMPED
10. AVERAGING TANK AGITATOR & REC PUMP ARE HYDRAULICALLY DRIVEN HALLIBURTON MODEL " CMS 506.

NOTE: 8

DESCRIPTION	STRM NO	4	5	6	7	8	10												
	UNITS																		
TOTAL FLOW	STPH	60.68	0	60.68	55.48	5.21	0.01												
SOLIDS FLOW	STPH	6.07	0	6.07	5.55	0.52	0.00												
LIQUID FLOW	STPH	54.61	0	54.61	49.93	4.69	0.01												
TOTAL FLOW	GPM	200.00	-	200.00	182.87	17.17	0.03												
SOLIDS WT%	WT%	10.00	100.00	10.00	10.00	10.00	0.00												
SOLIDS S. G.	-	1.67	1.67	1.67	1.67	1.67	-												
SLURRY S. G.	-	1.21		1.21	1.21	1.21	1.18												

4	CLIENT APPROVAL	DRB	
3	OFFICE CHECK		
2	OFFICE CHECK		
1	CLIENT APPROVAL		
0	PLAN C, POND 207C		

4	CLIENT APPROVAL	04/27/92	
3	OFFICE CHECK	04/13/92	
2	OFFICE CHECK	04/01/92	
1	CLIENT APPROVAL	03/11/92	

KEYWORDS
1. 207C AREA
2. POND SLUDGE
3. STABILIZATION
4. FLOW DIAGRAM
5. RECLAIM

	BY	DATE
DESIGNED	DRB	03/13/92
DRAWN	CA	04/13/92
CHECKED	BCH	04/24/92
APPROVED		

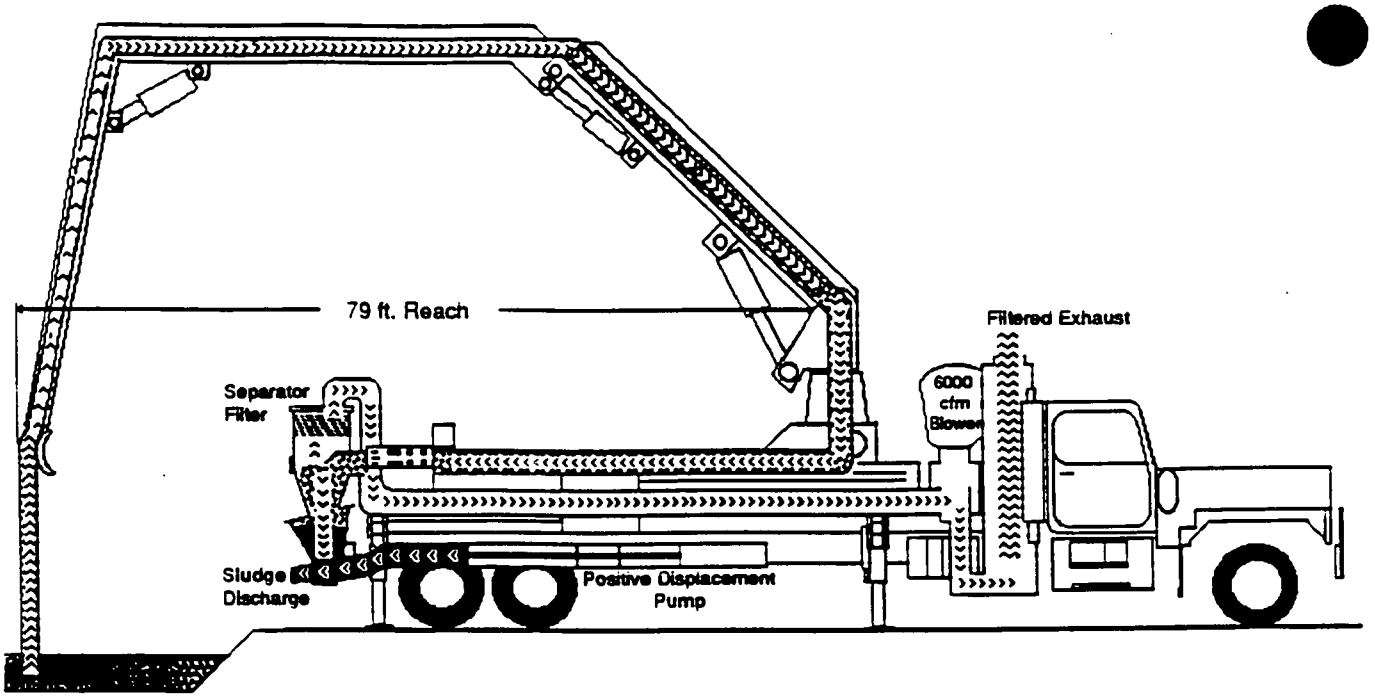
HALLIBURTON NUS Environmental Corporation

U.S. DEPARTMENT OF ENERG
ROCKY FLATS OFFICE
Rocky Flats Plant
GOLDEN, COLORADO

SOLAR POND/CONCRETE STABILIZATION PI
POND SLUDGE-PROCESS FLOW DIAGRAM
207C POND SLUDGE RECLAIM SYSTEM

SIZE D | 39717-0013 | 4 | 1

COMPUTER GENERATED
NO MANUAL CHANGES ALLOWED



Sludge Buster Specifications

Type: Air Conveyance Boom System

Boom System:

Pipeline Diameter: 8 Inches
Vertical Reach: 92 feet
Horizontal Reach at turret: 79 feet
Turret Access Range: 370 degrees
Number of Sections: 3

Section 1: 29 feet
2: 28.5 feet
3: 29 feet

Controls: Operator can control boom & pump from up to 300 feet away.

Power System: 400 HP Mack Diesel

Vacuum System:

Type: Roots 1220 Blower
Vacuum: 22 Inches of Hg.
Capacity: 6000 cubic feet per minute
Vacuum Breaker: Set at 22 Inches of Hg
Suction Line: 8 Inches

Pumping System:

Type: Positive Displacement
Piston Size: 8 Inches
Output Capacity: 117 cubic yards/hour or 393 gallons/minute
Pump Pressure: 1536 psi(maximum)
Pumping Distances: 15,000 feet*

Suction Attachments:

'Kings Crown'

Versatile head that provides ability to gouge away at harder, encrusted materials through boom action.

Water Blaster

High pressure water blasting(1-5,000psi) ring breaks the most difficult sludges to be pumped.

Air Pipe

Head attachment that enables air conveyanc to work in subsurface applications.

T - Pipe

Attachment that safely sweeps clean flexible membrane liners as well as existing liners.

* Distance & Quantity vary with material properties.

Safety:

- 3 Stage Boom give pinpoint control for operator.
- Remote Control Allows pump to be worked in 'Risk' environments.
- No Need for Labor or Operator to be exposed to contamination.
- Totally enclosed self sufficient system can work in remote areas.

Lefco Environmental Technology Inc., 15,001 Walden Road, Suite 203, Montgomery, Texas 77356
(409) 582-1088, Fax (409) 582-1099, 1-800-LEFCO-88

APPENDIX D

RECLAIM EQUIPMENT AND PROCESS FLOW DIAGRAMS FOR 207C/CLARIFIER AND 207 A/B PONDS REMEDIATION

- Oversee maintenance of OSHA training records and physicians fit-for-work statements.
- Perform health and safety reviews of project procedures.
- Supports preparation of Job and Operational Safety Analyses.
- Coordinates safety audits of the process area.
- Supports periodic On-site health and safety training.

C.16 DIRECTOR, HEALTH AND SAFETY (HNUS ENVIRONMENTAL CORPORATION)

- Establishes HNUS Environmental Technologies Group (HNUS - ETG) policies for health and safety, and implementation of policies.
- Ensures that qualified staff are assigned to perform field health and safety functions.
- Responsible for performance of HNUS-ETG health and safety staff and functions.
- Oversees health and safety functions through review of health and safety plans, other pertinent documents and reports, and On-site audits.
- Ensures adequacy of Health & Safety Plans.

C.13 LABORATORY MANAGER (ON-SITE)

- Working under the Off-site Project Manager, responsible for the safe installation and operation of the On-site laboratory.
- Responsible for final testing of laboratory trailer prior to start up.
- Responsible for On-site health and safety training for laboratory staff.
- Responsible for equipment testing and checkout of all analytical procedures, including safety aspects.
- Ensures that all requirements of the laboratory health and safety chemical hygiene plan are followed.

C.14 QUALITY ASSURANCE SUPERVISOR

- Reporting directly to the HNUS Environmental Technologies Group Director of Quality Assurance and indirectly to the Project Manager, responsible for preparation of the Site Specific QA plan.
- During waste processing operations, ensures that the Process Control Program (PCP), and Job and Operational Safety Analyses provisions and all associated documentation requirements are met.
- Assists in health and safety audits in the process and laboratory areas.

C.15 SITE HEALTH & SAFETY SUPERVISOR

- Reporting directly to the HNUS Environmental Technologies Group Director of Health and Safety and indirectly to the Project Manager, responsible for preparation of all required Site Specific Health and Safety Plans.
- During waste processing operations, responsible for independently overseeing site health and safety practices.
- Principal interface with the EG&G Radiation Protection Area Management.
- Coordinate required EG&G training for HNUS operations personnel.

- Oversees compliance with the PCP during waste processing operations.

- Oversees implementation of Job and Operational Safety Analyses during waste processing.

C.11 OPERATIONS/MAINTENANCE MANAGER

- Working under the Deputy Project Manager, responsible for the safe operation and maintenance of all process equipment.

- Responsible for ensuring the safe receipt and setup of process equipment at the HNUS Rocky Flats field office.

- Responsible for safe "cold testing" of process equipment before delivery to the Rocky Flats site.

- Responsible for supervising safe installation of process equipment On-site.

- Responsible for preparation of Job and Operational Safety Analyses.

- Assists in safety audits of the process area.

- Responsible for ensuring conduct of On-site safety meetings.

C.12 RESIDENT ENGINEER

- Responsible for collecting Engineering requirements including safety that are identified by Brown & Root Engineering at the Rocky Flats Complex.

- Responsible for notifying the operations/maintenance manager and the Site Health & Safety Supervisor of any safety precautions applicable to the process and process equipment.

- Ensures engineering safety during installation of Process Equipment.

- Assists in preparation of Job and Operational Safety Analyses.

- Assists in safety audits of the process area.

- Prepares all system installation packages with appropriate safety precautions.

C.8 LABORATORY MANAGER (OFF-SITE)

- Responsible to the Off-site Project Manager for performance of the NUS-LSG Laboratory subcontract.
- Responsible for preparation of the "On-site Laboratory Design Criteria" including applicable health, safety, and environmental criteria.
- Responsible for preparation of the "Laboratory Procurement Package", including applicable health, safety, and environmental specifications.
- Responsible for procurement, technical evaluation, purchasing, and expediting of all laboratory equipment, and ensuring that equipment meets applicable safety standards.
- Responsible for the preparation of all laboratory analytical procedures, and the laboratory health and safety chemical hygiene plan.
- Staffs the On-site lab in preparation for operation, and ensures that staff receive required health and safety training.

C.9 CONTRACT ADMINISTRATOR

- Administrates commercial aspects of all HNUS subcontracts working with the principal technical representatives, including the ASI Health & Safety Manager and ASI Project Manager.
- Purchasing agent for all project consumables and capital equipment required for the HNUS office (desks, computers, etc.) and ensures that equipment meets health and safety standards.

C.10 PROCESS CONTROL MANAGER

- Working under the Deputy Project Manager, responsible for assisting in the development of the Process Control Plan (PCP), including health, safety, and environmental procedures.

- Responsible for administration and implementation of the Health & Safety Plan of the NUS Laboratory Services Group (LSG) subcontract.

- Responsible for administration and implementation of the Health & Safety Plan of the NUS Environmental Management Group (EMG) subcontract.

C.5 PROCESS DEVELOPMENT MANAGER

- Responsible to the Off-site Project Manager for all process development activities and associated health and safety functions.

- Prepares the Waste Sampling Plan, Waste Analysis Plan, Standard Sampling Procedures and associated Health & Safety precautions, in conjunction with the Site H&S Supervisor.

- Overall responsibility for preparation of the "Process Development Report" and "Process Control Plan" (PCP), including health, safety, and environmental issues.

C.6 ENGINEERING MANAGER

- Procures processing equipment using Brown & Root as the HNUS agent while ensuring equipment meets applicable DOE, OSHA, EPA and Rocky Flats specifications.

- Principal administrator of the Brown & Root subcontract.

- Responsible for preparation of all engineering deliverables that includes proper health, safety, and environmental specifications.

C.7 BROWN & ROOT ENGINEERING MANAGER

- Responsible to the Engineering Manager for the preparation of engineering deliverables that includes applicable health, safety, and environmental specifications.

- Responsible for procurement; commercial and technical evaluations; purchasing; expediting traffic of all process equipment required for the project; and that such equipment meets applicable safety specifications.

C.3 DEPUTY RESIDENT PROJECT MANAGER

- Conducts On-site activities as directed by the Project Manager.
- Performs role of Project Manager when Project Manager is absent.
- Coordinates actions necessary to keep HNUS operations efficiently running at design capacity, in accordance with health, safety, and security requirements.
- Responsible for On-site activities, including implementation of health and safety procedures for equipment operation, laboratory support and process control.
- Responsible for maintaining project records, including health and safety records.
- Responsible for maintaining complete sets of Rocky Flats health and safety documentation at the HNUS - Denver office.
- Ensures timely and orderly health and safety reviews of project deliverables.
- Ensures that job safety analyses and operational safety analyses are completed prior to start-up of processing operations, or changes in operations.
- Takes appropriate action to correct health and safety violations.
- Ensures conduct of safety audits.

C.4 OFF-SITE PROJECT MANAGER

- Responsible directly to the Project Manager and indirectly to the Program Manager for all off-site activities including Process Development, Process System Engineering/Procurement and On-site Laboratory procurement; and preparation and implementation of off-site Health and Safety Plans.
- Maintains a complete duplicate set of project records and a second complete set of Rocky Flats issued controlled documentation, including health and safety materials.

C.1 PROGRAM MANAGER

- Overall HNUS responsibility for the Solar Pond/Pondcrete project and performance of the HNUS Project Team, including Health & Safety.
- Approves all changes in the project plan, cost estimate and schedule, while ensuring that health and safety functions are effective.
- Ensures environmental protection measures are incorporated into engineering design and equipment construction.

C.2 PROJECT MANAGER

- Responsible to the Program Manager for successful and safe completion of the Solar Pond/Pondcrete project.
- Approves all changes in the project plan, cost estimate and schedule, while ensuring that health and safety functions are intact.
- Responsible for establishing and managing the Rocky Flats Project Office, which includes a resident site Health & Safety Supervisor.
- Through the Off-site Project Manager, responsible for Process Development, Process System Design/Procurement and On-site Laboratory installation, including preparation of a Laboratory Health & Safety Plan.
- Responsible for On-site performance of the Site Health & Safety Supervisor. (Note that the site H&S supervisor does, however, have direct reporting line responsibility to the HNUS - Environmental Technologies Group corporate office.)
- Responsible for administration of the ASI subcontract providing services of a Health & Safety specialist.
- Responsible for the approval of all project deliverables before transmittal to EG&G, including Health & Safety Plans.
- Ensures that additions and revisions to the Health & Safety Plans are accomplished.

APPENDIX C

DESCRIPTION OF HEALTH, SAFETY, AND RADIOLOGICAL PROTECTION RESPONSIBILITIES FOR HNUS SOLAR PONDS PROJECT PERSONNEL

storage of flammable or combustible materials, and to provide emergency support in the event of an injury or accident.

B.19 OPERATIONAL METEOROLOGIST

The meteorologist is responsible for constant continuous surveillance of weather conditions at the site. In particular, the meteorologist keeps abreast of wind and storm conditions, and notifies EG&G and HNUS personnel at the site of adverse weather situations that call for special precautions, or evacuation of the operations at the site.

related) requirements, and will define the protocols for monitoring, clothing, respiratory protection and decontamination in accordance with prudent health physics practices and DOE directives. In addition, the Radiological Engineering Representative will assist Waste Operations management in the development, implementation, and review of any changes to engineering controls at the SEP site. Complaints and concerns from radiological hazards, will be addressed by the Radiological Engineer. Serve as ALARA committee secretary.

B.15 ENVIRONMENTAL RESTORATION REPRESENTATIVE

The Environmental Restoration Representative will prepare the RCRA spill report required within 15 days of a spill, and coordinate RCRA closure activities at the SEP site, at the appropriate time.

B.16 PERMITTING AND COMPLIANCE REPRESENTATIVE

The Permitting and Compliance Representative will ensure that routine RCRA internal audits are conducted at the SEP site, through the Waste Surveillance group and will review and sign off on safe operating procedures through the Waste Guidance group.

B.17 OCCUPATIONAL HEALTH DIRECTOR

The Occupational Health Director is responsible for the administration of the Rocky Flats Plant (RFP) Occupational Health Program. These responsibilities include:

- Maintaining EG&G medical records.
- Correlating exposure data to ensure that the scope of annual physical examinations are correct.
- Issuing letters to employees concerning potential exposures to hazardous materials based on bioassays.

B.18 FIRE PROTECTION REPRESENTATIVE

The Fire Department is responsible for minimizing the potential for damage and injury to health and property as a result of fire. This is accomplished by ensuring that adequate fire suppression systems are available site-wide, that audits and inspections are conducted to abate potentially hazardous situations such as the improper

- Maintaining a distribution listing of all controlled copies.
- Ensuring that obsolete documents are removed from circulation.

B.12 INDUSTRIAL SAFETY REPRESENTATIVE

- Reviewing operations for potential safety and health hazards;
- Recommending appropriate personal protective equipment;
- Acting as consultants to Hazardous Waste Operations;
- Reviewing health and safety programs and plans for technical accuracy and compliance with health and safety regulations; and
- Performing audits/inspections of Hazardous Waste Operations procedures and operations.

B.13 RADIOLOGICAL OPERATIONS FOREMAN

The Radiological Operations Foreman (ROF) has responsibility for providing qualified Radiological Protection Technologists (RPTs) to the SEP site to implement the radiological monitoring program (Section 10). The ROF must also provide oversight, professional guidance and direction, and ensure the thoroughness and accuracy of the RPTs. The ROF must also work with Radiological engineering to provide guidance and implementation of the Radiological Protection Program.

B.13.1 RADIOLOGICAL PROTECTION TECHNICIANS

RPT practices shall be in conformance with Radiological Operating Instructions (ROI's). RPTs will be responsible for notifying on-site supervision when action levels are approached or reached and for documenting all monitoring results. RPTs will conduct monitoring and will know the action levels for radiological contamination.

B.14 RADIOLOGICAL ENGINEERING REPRESENTATIVE

The Radiological Engineering Representative will define the requirements for radiation protection for the SEP site as required by the Rocky Flats Radiation Control Program, DOE and ANSI (and

B.9 SITE HEALTH AND SAFETY COORDINATOR

A Site Health and Safety Coordinator (SHSC) will be assigned from the Health and Safety Department by the Health & Safety Liaison Officer to oversee Health and Safety Plan implementation at each Operable Unit. The SHSC will report to the H&S Liaison Officer and will keep the Radiological Protection Site Project Manager informed of health and safety related activities on the site. The SHSC has the following responsibilities:

- Oversees EG&G and subcontractor work to ensure that the requirements and principles of this HASP and the Site Specific HASPs, OSAs and JSAs are followed.
- Performs audits for proper and appropriate use of PPE, monitoring and decontamination procedures, access control and required documentation.
- Alerts the Environmental Restoration (ER) Site Project Manager and the H&S Liaison Officer of health and safety violations at the ER remedial project work site.
- Coordinate development and review of changes to engineering controls.

B.10 HEALTH AND SAFETY LIAISON OFFICER

- Coordinates health and safety activities with the Environmental Restoration H&S Officer and the ER Site Project Managers.
- Implements the HASP by providing and supervising EG&G Site Health and Safety Coordinators at each designated ER site.
- Prepares EG&G Health and Safety Plans (HASPs).
- Supervises the EG&G Site Health and Safety Coordinators.

B.11 HEALTH AND SAFETY PLAN DOCUMENT CONTROL OFFICER

Responsibilities:

- Publishing revisions or additions to the Health and Safety Plan in a timely manner.
- Providing the latest approved issue of the H&SP.

B.6.6 CHEMICAL OPERATORS

- Reporting process equipment malfunctions.
- Reporting conditions that could result in potential worker exposure or a release of materials to the environment.
- Ensuring that housekeeping problems do not exist.
- Complying with safety and operational procedures.

B.7 HEALTH AND SAFETY AREA ADMINISTRATOR

The Health & Safety Area Administrator is responsible for the management of a multi-discipline safety team. As the safety team leader, the H&S Area Administrator ensures effective communications within the H&S organization. In addition, the H&S Area Administrator will assist SEP Site management in the completion of Operational Safety Analyses, Job Safety Analyses, etc., in accordance with the Rocky Flats Policies and/or Health & Safety Procedures Manual.

The Health & Safety Area Administrator will:

- Implement the policies and requirements established by EG&G.
- Enforce "Stop-Work-Orders" if any operation threatens worker health or safety.

B.8 INDUSTRIAL HYGIENE REPRESENTATIVE

The Industrial Hygiene (IH) Representative is responsible for implementing the chemical monitoring program (see Section 10 of this Plan). This includes initial evaluation of the site to ensure respiratory and clothing protection levels are adequate, and generation of sufficient data upon which further personal protective equipment (PPE) decisions may be based. The IH Representative is responsible for implementing the monitoring program for the duration of the operations at the SEP site and re-evaluating PPE requirements, if necessary, due to changing site conditions. In addition, the IH representative will assist Waste Operations management in the implementation and review of changes to engineering controls at the SEP site that could potentially effect exposures. Finally, the Industrial Hygiene Representative will address complaints and concerns from management and operators at the SEP site concerning industrial hygiene at the site.

- Interfacing with the health and safety divisions to ensure that appropriate safety measures have been implemented at the SEP site.

- Ensuring that employees are adequately trained in the hazards associated with the facility operation, equipment and hazardous materials handled or utilized on site.

B.5 SHIFT MANAGERS

Responsibilities of the Shift Managers include:

- Ensuring that remediation operations on the SEP site run safely and smoothly;

- Seeing that RCRA inspections are performed as required.

- Reporting spills and assigning personnel to respond to spills.

- Ensuring that EG&G employees are familiar with and comply with housekeeping, safety, and operating requirements.

- Promoting improvements in housekeeping and safety.

- Verifying that EG&G and subcontractor personnel working at the SEP site are fully qualified to perform the work by auditing available training and medical surveillance records, and by observing performance of field duties.

B.6 SITE FOREMAN

Responsibilities of the Site Foreman include:

- Managing field operations.

- Executing the work plan and schedule.

- Enforcing safety procedures.

- Coordinating protection levels with Industrial Hygiene and Radiological Engineering.

- Enforcing site control.

- Documenting site activities.

- Implementing emergency response and notification procedures.

- Proactively seeking ways to improve safety performance and general housekeeping in work areas.

- Providing management direction and guidance to achieve and ensure the proper training and certification of foremen, shift managers, salaried and hourly personnel in accordance with EG&G policy.

- Maintaining responsibility for all personnel assigned to the complex when an emergency occurs and working closely with the Shift Superintendent to ensure employee safety, property safety, and minimization of loss when possible.

- Serving as the single point of authority to coordinate and facilitate any action necessary to keep the complex operating at design capacity, safely, efficiently, and in keeping with all security requirements.

- Serving as chairperson of (or appointing a designee to chair) the ALARA committee.

B.3 DEPUTY OPERATIONS MANAGER

The Deputy Operations Manager reports directly to the Operations Manager and assists in implementing the responsibilities of the Operations Manager. In addition, the Deputy Operations Manager's safety responsibilities include:

- Directing implementation of the Health & Safety Plan in the field for EG&G activities.

- Recommending additions and revisions to the Health & Safety Plan as necessary.

- Acting on EG&G employee concerns in accordance with the procedures outlined in Plant Policies and Procedures.

- Initiating appropriate action to correct E&G& safety violations.

B.4 SITE OPERATIONS SUPERVISOR

- Ensuring that specific site requirements of the EG&G and HNUS Health & Safety Plans (e.g., sign requirements, decontamination facilities, etc.) are in place and operational prior to start-up.

B.1 PROJECT MANAGER

- Single point EG&G responsibility for the Solar Pond/Pondcrete project and performance of the EG&G project team, including health, safety, radiological, and environmental specialists.

- Ensures that key EG&G personnel with expertise in health and safety; and environmental and radiological protection are assigned specific tasks as applicable during the planning and execution phases of the project.

- Approves all changes in cost estimate and schedule, while ensuring health and safety functions are intact.

- Addressee and approval responsibility for all deliverables including all health and safety plans, and health and safety aspects of all Standard Operating Procedures (SOPs). Coordinates any other internal reviews for these deliverables that may be required at Rocky Flats.

- Ensuring that the SEP Health & Safety Plan is prepared, reviewed and approved by the appropriate individuals within the Department of Energy (DOE), the Rocky Flats Plant and other governing agencies.

- Single point responsibility for all public relations and regulatory activities.

B.2 OPERATIONS MANAGER

The Operations Manager is responsible for all EG&G activities associated with pond clean-up operations at the SEP site. These activities include:

- Providing management, operational direction, and technical input to assure that all plant resources are utilized to safely support the production facility in accordance with EG&G policies, directives and regulations.

- Performing audits of all operations as required to maintain compliance with policies, procedures, directives, etc., with emphasis on safety.

- Ensuring all EG&G employees conform to the safety requirements of their job through familiarity and policies, requirements, and procedures.

APPENDIX B

DESCRIPTIONS OF HEALTH, SAFETY AND RADIOLOGICAL PROTECTION RESPONSIBILITIES FOR EG&G PERSONNEL IN SUPPORT OF THE SOLAR PONDS PROJECT

10-min ceiling 10 ppm (NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 140] **PEER REVIEWED**

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 10 ppm, 14 mg/cu m; Short Term Exposure Limit (STEL) 15 ppm, 21 mg/cu m (1976) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 26] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS: ND

[HSDB] SS 17 /cf?
USER:

: - HSDB

NAME OF SUBSTANCE	HYDROGEN SULFIDE
CAS REGISTRY NUMBER	7783-06-4
MOLECULAR FORMULA	H2-S **PEER REVIEWED**
BOILING POINT	-60.33 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 697] **PEER REVIEWED**
MELTING POINT	-85.49 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 697] **PEER REVIEWED**
CORROSIVITY	ND
HAZARDS SUMMARY	ND
RADIATION LIMITS AND POTENTIAL	ND
TOXIC HAZARD RATING	ND

HUMAN TOXICITY VALUES

Man: severe toxic effects 200 ppm = 280 mg/cu m 1 min; symptoms of illness 50 ppm = 70 mg/cu m; unsatisfactory: 20 ppm = 28 mg/cu m [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. , p. 745] **PEER REVIEWED**

HUMAN TOXICITY VALUES

Man: lethal: 600 ppm/30 min; 800 ppm, immediate /lethality/ [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983. , p. 745] **PEER REVIEWED**

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

300 ppm [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 140] **PEER REVIEWED**

OSHA STANDARDS

During an 8 hr work shift an employee may be exposed to a concentration of hydrogen sulfide above 20 ppm but never above 50 ppm only for a maximum period of 10 min once and and only if no other measurable exposure occurs. /Transitional limits/ must continue to be achieved by any combination of engineering controls, work practice, and personal protective equipment during the phase-in period, Sept. 1, 1989 through Dec 30, 1992. Final rule limits become effective Dec 31, 1992. [29 CFR 1910.1000 (7/1/88)] **PEER REVIEWED**

OSHA STANDARDS

8 hr Time-Weighted avg: 10 ppm (14 mg/cu m). /Final rule limits/ shall be achieved by any combination of engineering controls, work practices and personal protective equipment during the phase-in period, Sept 1, 1989 through Dec 30, 1992. Final rule limits become effective Dec 31, 1992. [54 FR 2920 (1/19/89)] **PEER REVIEWED**

OSHA STANDARDS

15 min Short-Term Exposure Limits: 15 ppm (21 mg/cu m). /Final rule limits/ shall be achieved by any combination of engineering controls work practices and personal protective equipment during the phase-in period, Sept 1, 1989 through Dec 30, 1992. Final rule limits become effective Dec 31, 1992. [54 FR 2920 (1/19/89)] **PEER REVIEWED**

OSHA STANDARDS

Meets criteria for OSHA medical records rule. [29 CFR 1910.20 (7/1/88)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS

REVIEWED++
OTHER OCCUPATIONAL PERMISSIBLE LEVELS
Inorganic cyanide standards: Bulgaria 0.3 mg/cu m; Czechoslovakia 3-15 mg/cu m; Finland 7 mg/cu m; Federal Republic of Germany 5 mg/cu m; Hungary 0.3 mg/cu m; Poland 0.3 mg/cu m; Rosania 0.3 mg/cu m; USSR 0.3 mg/cu m; and Yugoslavia 5 mg/cu m. /Calcium, potassium, sodium, cyanide salts/ [NIOSH; Criteria Document: Hydrogen Cyanide and Cyanide Salts p.190 (1976) DHEW Pub. NIOSH 77-108] **PEER REVIEWED++

[HSDB] SS 16 /cf?
USER:

: - HSDB

NAME OF SUBSTANCE	HYDROGEN CYANIDE
CAS REGISTRY NUMBER	74-90-8
MOLECULAR FORMULA	C-H-N **PEER REVIEWED**
BOILING POINT	25.6 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 639] **PEER REVIEWED**
MELTING POINT	-13.4 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 639] **PEER REVIEWED**
CORROSIVITY	Although HCN is a weak acid and normally not considered corrosive, it has a corrosive effect under two special conditions: (1) water solutions of HCN cause transcrystalline stress-cracking of carbon steels under stress even at room temperature and in dilute solution; (2) water solutions of HCN containing sulfuric acid as a stabilizer severely corrode steel above 40 deg C and stainless steels above 80 deg C. [Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984. 7(79) 309] **PEER REVIEWED**
CORROSIVITY	Liquid hydrogen cyanide will attack some forms of plastics, rubber, and coatings. [Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981. , p. 2] **PEER REVIEWED**
HAZARDS SUMMARY	ND
RADIATION LIMITS AND POTENTIAL	ND
TOXIC HAZARD RATING	ND
HUMAN TOXICITY VALUES	ND

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

50 ppm, as CN [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 138] **PEER REVIEWED**

OSHA STANDARDS

Meets criteria for OSHA medical records rule. /Cyanide (as CN)/ [29 CFR 1910.20 (7/1/87)] **PEER REVIEWED**

OSHA STANDARDS

8 hr Time-Weighted avg: 10 ppm (11 mg/cu m) (skin) [29 CFR 1910.1000 (7/1/87)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS

4.7 ppm (5 mg/cu m) ceiling for 10 min. /Hydrogen cyanide and cyanide salts/ [NIOSH/CDC. NIOSH Recommendations for Occupational Safety and Health Standards Sept. 1986. (Supplement to Morbidity and Mortality Weekly Report 35 No. 1S, Sept. 26, 1986) 19S] **PEER REVIEWED**

THRESHOLD LIMIT VALUES

Ceiling Limit 10 ppm, 11 mg/cu m, skin (1988) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists. 1989. , p. 26] **QC**

screening test if a quantitative test is not practical. (1989-90 adoption) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 64] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS

Maximum allowable concentrations range from 10 mg/cu m (1.5 ppm, ceiling value) in the USSR, 140 mg/cu m (20 ppm, TWA) in Sweden, and 250 mg/cu m (37 ppm) in Czechoslovakia to 340 mg/cu m (50 ppm) in the Federal Republic of Germany, Japan. Short-term exposure limits range from 340 mg/cu m (50 ppm) in Sweden to 1250 mg/cu m (183 ppm) in Czechoslovakia and 1340 mg/cu m (200 ppm) in the USA. The acceptable limit in Brazil is 525 mg/cu m (78 ppm) for 48 hr per week. [WHO; Environ Health Criteria: Tetrachloroethylene p.35 (1984)] **PEER REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS

Maximum allowable concentrations are 1.0 mg/cu m average per day or 4.0 mg/cu m average per 0.5 hr in Czechoslovakia and 0.06 mg/cu m average per day in the USSR. [WHO; Environ Health Criteria: Tetrachloroethylene p.35 (1984)] **PEER REVIEWED**

[HSDB] SS 23 /cf?
USER:

Health Organization. International Agency for Research on Cancer. 1972-1985. (Multivolume work). 57 335 (1987)] ++PEER REVIEWED++

HUMAN TOXICITY VALUES ND

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

NIOSH has recommended that tetrachloroethylene be treated as a potential human carcinogen. [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO. February 1987. , p. 220] ++PEER REVIEWED++

OSHA STANDARDS

Meets criteria for OSHA medical records rule. [29 CFR 1910.20 (7/1/87)] ++PEER REVIEWED++

OSHA STANDARDS

During an 8 hr work shift, an employee may be exposed to a concentration of tetrachloroethylene above 200 ppm (but never above 300 ppm) only for a maximum period of 5 minutes in any 3 hours. Such exposure must be compensated by exposures to concentrations less than 100 ppm so that the cumulative exposure for the entire 8 hr work shift does not exceed a weighted average of 100 ppm. [29 CFR 1910.1000 (7/1/87)] ++PEER REVIEWED++

NIOSH RECOMMENDATIONS

NIOSH recommends that tetrachloroethylene be treated as a potential human carcinogen. [NIOSH/CDC. NIOSH Recommendations for Occupational Safety and Health Standards Sept. 1986. (Supplement to Morbidity and Mortality Weekly Report 35 No. 15, Sept. 26, 1986) 30S] ++PEER REVIEWED++

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 50 ppm, 339 mg/cu m; Short Term Exposure Limit (STEL) 200 ppm, 1368 mg/cu m (1984) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 33] ++QC REVIEWED++

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Perchloroethylene in end-exhaled air prior to the last shift of workweek is 10 ppm. (1989-90 adoption) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 64] ++QC REVIEWED++

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Perchloroethylene in blood prior to the last shift of workweek is 1 mg/l. (1989-90 adoption) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 64] ++QC REVIEWED++

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Trichloroacetic acid in urine at end of workweek is 7 mg/l. The determinant is nonspecific, since it is observed after exposure to some other chemicals. These nonspecific tests are preferred because they are easy to use and usually offer a better correlation with exposure than specific tests. In such instances, a BEI for a specific, less quantitative biological determinant is recommended as a confirmatory test. The biological determinant is an indicator of exposure to the chemical, but the quantitative interpretation of the measurements is ambiguous. Their BEIs should be applied cautiously. These biological determinants should be used as confirmatory tests mainly for confirmation of exposures indicated by measurements of a nonspecific determinant or as a

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NAME OF SUBSTANCE	TETRACHLOROETHYLENE
CAS REGISTRY NUMBER	127-18-4
MOLECULAR FORMULA	C2-C14 **PEER REVIEWED**
BOILING POINT	121 DEG C AT 760 MM HG (Weast, R.C. (ed.) Handbook of Chemistry and Physics, 68th ed. Boca Raton, Florida: CRC Press Inc., 1987-1988. C-272) **PEER REVIEWED**
MELTING POINT	-19 DEG C (Weast, R.C. (ed.) Handbook of Chemistry and Physics, 68th ed. Boca Raton, Florida: CRC Press Inc., 1987-1988. C-272) **PEER REVIEWED**
CORROSIVITY	Corrosion of aluminum, iron, & zinc, which is negligible unless water is present, can be inhibited by the addition of stabilizers (Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984. 5(79) 756) **PEER REVIEWED**

HAZARDS SUMMARY

The major hazards encountered in the use and handling of tetrachloroethylene stem from its toxicologic properties. Exposure to this colorless liquid may occur from its use as a solvent and as an intermediate in chemical syntheses. In addition to eye and skin inflammation from contacting liquid tetrachloroethylene, inhalation of its vapor can cause central nervous system depression, liver necrosis, and effects on the lung, heart, and kidney. The ACGIH recommends a workplace limit (TLV) of 50 ppm as an 8 hr time-weighted average (TWA) with a note to prevent skin contact. Tetrachloroethylene's sweet chloroform-like odor may warn of its presence at a sub-TLV level of 4.68 ppm; however, to assure against exposure, it is recommended that self-contained breathing apparatus and full protective clothing be worn, especially in fire or spill situations. Although considered nonflammable, containers of tetrachloroethylene may explode in the heat of a fire and its vapor will decompose in contact with open flames or red-heated materials to yield the poisonous gas, phosgene. For small fires involving tetrachloroethylene, extinguish with dry chemical or CO_2, and for large fires, use water spray, fog, or foam. Cool containers with water. If the fire involves a tank car or truck, isolate the area for 1/2 mile in all directions. Tetrachloroethylene should be stored in a cool, dry, well-ventilated location, away from strong oxidizers, potential fire hazards, caustic soda, potash, and chemically active metals such as barium, lithium, and beryllium. Regulated by the IATA, tetrachloroethylene may be shipped in tank cars, tank trucks, and 5- and 55-gallon steel drums. For small spills of tetrachloroethylene, ventilate the area then take up with vermiculite, dry sand, or earth. Large spills should be diked for later disposal. Prior to implementing land disposal of waste residues (including waste sludge), consult environmental regulatory agencies for guidance. **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL TOXIC HAZARD RATING: ND

Classification of carcinogenicity: 1) Evidence in humans: inadequate; 2) evidence in animals: sufficient; Overall summary evaluation of carcinogenic risk to humans is group 2B: The agent is possibly carcinogenic to humans. /From table/ (IARC. Monograpns on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World

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NAME OF SUBSTANCE METHYL ETHYL KETONE
CAS REGISTRY NUMBER 78-93-3
NAME OF SUBSTANCE METHYL ETHYL KETONE
MOLECULAR FORMULA C4-H8-O ++PEER REVIEWED++
BOILING POINT 79.6 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 870] ++PEER REVIEWED++
MELTING POINT -86.3 DEG C [Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. C-353] ++PEER REVIEWED++
CORROSIVITY ND
HAZARDS SUMMARY ND
RADIATION LIMITS AND POTENTIAL ND
TOXIC HAZARD RATING ND
HUMAN TOXICITY VALUES ND
IMMEDIATELY DANGEROUS TO LIFE OR HEALTH
3000 ppm [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 60] ++PEER REVIEWED++
OSHA STANDARDS
Meets criteria for OSHA medical records rule. [29 CFR 1910.20 (7/1/87)] ++PEER REVIEWED++
OSHA STANDARDS
8 hr Time-Weighted avg: 200 ppm (590 mg/cu m) [29 CFR 1910.1000 (7/1/87)] ++PEER REVIEWED++
NIOSH RECOMMENDATIONS ND
THRESHOLD LIMIT VALUES
Time Weighted Avg (TWA) 200 ppm, 590 mg/cu m; Short Term Exposure Limit (STEL) 300 ppm, 885 mg/cu m (1976) [American Conference of Governmental Industrial Hygienists. TLV's Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indicies for 1991-1992. Cincinnati, OH: ACGIH, 1991. , p. 27] ++QC REVIEWED++
THRESHOLD LIMIT VALUES
BEI (Biological Exposure Index): Methyl ethyl ketone in urine at end of shift is 2 mg/l. (1988-89 adoption) [American Conference of Governmental Industrial Hygienists. TLV's Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indicies for 1991-1992. Cincinnati, OH: ACGIH, 1991. , p. 66] ++QC REVIEWED++
OTHER OCCUPATIONAL PERMISSIBLE LEVELS ND

[HSDB] SS 2 /cf?
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an unexpected critical excursion unless special preventive measures are taken, incl uncritical configuration, neutron poisons, and administrative control. /Isotopes of uranium/ [Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984. 23(83) 543] **PEER REVIEWED**

TOXIC HAZARD RATING ND

HUMAN TOXICITY VALUES ND

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

30 mg/cu m /Uranium, insoluble compounds (as U)/ [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 234] **PEER REVIEWED**

OSHA STANDARDS

8 hr Time-Weighted avg: 0.25 mg/cu m. /Uranium, insol cmpd/ [29 CFR 1910.1000 (7/1/88)] **PEER REVIEWED**

OSHA STANDARDS

Meets criteria for OSHA medical records rule. [29 CFR 1910.20 (7/1/88)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS ND

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 0.2 mg/cu m; Short Term Exposure Limit (STEL) 0.6 mg/cu m (1976) /Uranium (natural) soluble & insoluble compounds, as U/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 42] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS

Maximum Allowable Concn (MAC) USSR 0.015 mg/cu m (soluble cmpd), 0.075 mg/cu m (insoluble cmpd) /Uranium cmpd/ [International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983. , p. 2237] **PEER REVIEWED**

[HSDB] SS 27 /cf?
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NAME OF SUBSTANCE	URANIUM
CAS REGISTRY NUMBER	7440-61-1
MOLECULAR FORMULA	U **PEER REVIEWED**
BOILING POINT	3818 DEG C [Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. B-141] **PEER REVIEWED**
MELTING POINT	1132.3 + or - 0.8 DEG C [Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. B-141] **PEER REVIEWED**
CORROSIVITY	ND
HAZARDS SUMMARY	ND

RADIATION LIMITS AND POTENTIAL

PURE URANIUM DOES NOT CONSTITUTE AN EXTERNAL RADIATION HAZARD SINCE IT EMITS MAINLY ALPHA-RADIATION AT A LOW ENERGY LEVEL. IT DOES, HOWEVER, CONSTITUTE AN INTERNAL RADIATION HAZARD IF IT ENTERS THE BODY. [International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983. , p. 2238] **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL

DECAYS TO (234)THORIUM VIA ALPHA EMISSION OF 4.2 MILLION ELECTRON VOLTS. [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. , p. 1224] **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL

There are fifteen known isotopes of uranium, not counting the isomeric state; three, (234)uranium, (235)uranium, & (238)uranium exist in nature. All isotopes of uranium are instable and, as they decay, emit alpha or beta particles. The most stable ... isotope is (238)uranium. /Isotopes of uranium/ [Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984. 23(83) 513] **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL

(238)uranium half-time: 4.5X10+9 yr, alpha-energies: approx 4.2 MeV 100%, gamma-energies: 0.048 MeV 0%; (235)uranium half-time: 7.1X10+8 yr, alpha-energies: 4.8-4.56 MeV, gamma-energies 0.095 MeV 9%, 0.143 MeV 12%, 0.185 MeV 55%; (234)uranium half-time: 2.5X10+5 yr, alpha-energies: 4.717 MeV 28%, 4.768 MeV 72%, gamma-energies 0.051 MeV 0%. /Isotopes of uranium/ [Friberg, L., Nordberg, G.F., Kessler, E. and Vouk, V.B. (eds). Handbook of the Toxicology of Metals. 2nd ed. Vols I, II.: Amsterdam: Elsevier Science Publishers B.V., 1986. V2 624] **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL

Radiation from uranium has low penetration & elaborate shielding is unnecessary. [International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983. , p. 955] **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL

... SUSPECTED THAT RADIOACTIVITY OF ORE & PRESENCE OF RADON IN MINE AIR WERE RESPONSIBLE AGENTS /IN CAUSE OF TUMORS/. [Hamilton, A., and H. L. Hardy. Industrial Toxicology. 3rd ed. Acton, Mass.: Publishing Sciences Group, Inc., 1974. , p. 395] **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL

Large quantities of (233)uranium or (235)uranium that exceed the minimum critical mass may be a hazard because they may be the source of

Conference of Governmental Industrial Hygienists. 1989. , p. 37] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists. 1989. , p. 6] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS

Other recommendations: Austria, Belgium, Finland, Germany (FGR), Netherlands, Switzerland ... and Yugoslavia all at 0.01 mg/cu m; Romania- 0.005 mg/cu m avg and 0.015 mg/cu m maximum. /Silver & compd/ [American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists. 1986. , p. 529] **PEER REVIEWED**

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NAME OF SUBSTANCE	SILVER
CAS REGISTRY NUMBER	7440-22-4
MOLECULAR FORMULA	Ag **QC REVIEWED**
BOILING POINT	APPROX 2000 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 1221] **PEER REVIEWED**
MELTING POINT	960.5 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 1221] **PEER REVIEWED**
CORROSIVITY	ND

HAZARDS SUMMARY

The major hazards encountered in the use and handling of silver stem from its toxicologic properties. Toxic by all routes (ie, inhalation, ingestion, and dermal contact), exposure to silver (as a finely divided metal, or in solution) may occur from its use in electroplating, as a component of photographic materials, in the manufacture of jewelry, mirrors, coinage, pigments, antiseptics, and in brazing and welding. Effects from exposure may include skin or eye irritation, mild bronchitis, metal fume fever, and argyria, a blue-gray discoloration of the skin, mucous membranes, and eyes. Also, hepatic damage has been implicated with soluble silver salts. The OSHA PEL is set at a TWA of 0.01 mg/cu m. Safe levels should be maintained by the use of engineering controls (eg, local exhaust ventilation, or process enclosure). In activities where over-exposure to silver may occur, workers should wear impervious clothing, gloves, face protection, and a self-contained breathing apparatus. Such clothing and equipment should be removed before leaving the worksite. Skin that becomes contaminated with silver should be promptly washed. Eating and smoking should be prohibited in silver work areas. Finely divided silver dust is flammable. Also, explosive compounds may form when silver mixes with acetylene, ammonia, or hydrogen peroxide. Before shipping silver, consult with the regulatory requirements of the US Department of Transportation. If powdered silver or solutions of silver are spilled, first ventilate the area, then collect the spilled material (solutions are first absorbed in vermiculite, dry sand, or earth) and place in sealed containers for reclamation. Before implementing land disposal of silver waste, consult with environmental regulatory agencies for guidance. **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL	ND
TOXIC HAZARD RATING	ND
HUMAN TOXICITY VALUES	ND
IMMEDIATELY DANGEROUS TO LIFE OR HEALTH	ND

OSHA STANDARDS

Meets criteria for OSHA medical records rule. [29 CFR 1910.20 (7/1/87)] **PEER REVIEWED**

OSHA STANDARDS

8-hr Time-Weighted avg: (0.01 mg/cu m) [29 CFR 1910.1000 (7/1/87)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS ND

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 0.1 mg/cu m (1981) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American

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NAME OF SUBSTANCE	PLUTONIUM
CAS REGISTRY NUMBER	7440-07-5
MOLECULAR FORMULA	Pu **PEER REVIEWED**
BOILING POINT	3232 deg C /Plutonium, alpha form/ (Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. B-115] **PEER REVIEWED**
MELTING POINT	641 deg C /Plutonium, alpha form/ (Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. B-115] **PEER REVIEWED**
CORROSIVITY	ND
HAZARDS SUMMARY	ND

RADIATION LIMITS AND POTENTIAL

Because of the high rate of emisson of alpha particles and the element being specifically absorbed by bone marrow ... plutonium /is/ a radiological poison ... and a very dangerous radiological hazard. (Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. B-29] **PEER REVIEWED**

RADIATION LIMITS AND POTENTIAL

Plutonium in liquid solution is more likely to become critical than solid plutonium. The shape of the mass must also be considered where criticality is concerned. [Weast, R.C. (ed.) Handbook of Chemistry and Physics. 69th ed. Boca Raton, FL: CRC Press Inc., 1988-1989. B-29] **PEER REVIEWED**

TOXIC HAZARD RATING	ND
HUMAN TOXICITY VALUES	ND
IMMEDIATELY DANGEROUS TO LIFE OR HEALTH	ND
OSHA STANDARDS	ND
NIOSH RECOMMENDATIONS	ND
THRESHOLD LIMIT VALUES	ND

OTHER OCCUPATIONAL PERMISSIBLE LEVELS

Maximum permissible concentration of (238)plutonium in air 7x10-13 u curie/cc; of (239)plutonium in air: 6x10-13 u curie/cc. [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. . p. 1087] **PEER REVIEWED**

[HSDB] SS 26 /cf?
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the first time, or for which a change in the "Adopted" listing has been proposed. The proposed limits should be considered trial limits that will remain in the listing for a period of at least two years. If, after two years no evidence comes to light that questions the appropriateness of the values herein, the values will be reconsidered for the "Adopted" list. Time Weighted Avg (TWA) 0.05 mg/cu m [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists. 1989. , p. 45] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Notice of Intended Change (first notice appeared in 1989-90 edition): A1. A1= Confirmed human carcinogen. [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 45] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS

Max allowable concn (MAC) USSR 0.5 mg/cu m /Nickel, nickel oxide and nickel sulfides as dust/ [International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983. , p. 1438] **PEER REVIEWED**

[HSDB] SS 10 /cf?
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NAME OF SUBSTANCE	NICKEL
CAS REGISTRY NUMBER	7440-02-0
MOLECULAR FORMULA	Ni **QC REVIEWED**
BOILING POINT	2730 deg C [Weast, R.C. (ed.) Handbook of Chemistry and Physics, 68th ed. Boca Raton, Florida: CRC Press Inc., 1987-1988. B-110] **PEER REVIEWED**
MELTING POINT	1455 deg C [Weast, R.C. (ed.) Handbook of Chemistry and Physics, 68th ed. Boca Raton, Florida: CRC Press Inc., 1987-1988. B-110] **PEER REVIEWED**
CORROSIVITY	ND
HAZARDS SUMMARY	ND
RADIATION LIMITS AND POTENTIAL	ND

TOXIC HAZARD RATING

Classification of carcinogenicity: 1) evidence in humans: sufficient; 2) evidence in animals: sufficient. Overall summary evaluation of carcinogenic risk to humans is group 1: The chemical is carcinogenic to humans. /From table, nickel & nickel cmpd/ [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). S7 67 (1987)] **PEER REVIEWED**

HUMAN TOXICITY VALUES ND

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

NIOSH has recommended that nickel be treated as a potential human carcinogen. [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 172] **PEER REVIEWED**

OSHA STANDARDS

Meets criteria for OSHA medical records rule. /Nickel, metal and soluble cmpd, as Ni/ [29 CFR 1910.20 (7/1/87)] **PEER REVIEWED**

OSHA STANDARDS

8-hr Time-Weighted avg: 1.0 mg/cu m. /Nickel, metal and soluble cmpd, as Ni/ [29 CFR 1910.1000 (7/1/87)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS

NIOSH recommends that the substance be treated as a potential human carcinogen. /Nickel, inorganic compounds/ [NIOSH/CDC. NIOSH Recommendations for Occupational Safety and Health Standards Sept. 1986. (Supplement to Morbidity and Mortality Weekly Report 35 No. 1S, Sept. 26, 1986) 245] **PEER REVIEWED**

NIOSH RECOMMENDATIONS

10 Hr TWA 15 ug nickel/cu m. /Nickel, inorganic cmpd/ [NIOSH/CDC. NIOSH Recommendations for Occupational Safety and Health Standards Sept. 1986. (Supplement to Morbidity and Mortality Weekly Report 35 No. 1S, Sept. 26, 1986) 245] **PEER REVIEWED**

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 1 mg/cu m [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 31] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Notice of Intended Change (first notice appeared in 1989-90 edition): The ACGIH has listed chemicals for which a limit has been proposed for

the effect of the chemical, thus leaving it unprotected by the recommended BEI. (1987-1988 adoption) /Lead/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 63] **QC REVIEWED**

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Lead in blood (timing is not critical) is 50 ug/100 ml. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. (1987-1988 adoption) /Lead/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 63] **QC REVIEWED**

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Lead in urine (timing is not critical) is 150 ug/g creatinine. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. (1987-1988 adoption) /Lead/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 63] **QC REVIEWED**

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Zinc protoporphyrin in blood after 1 month exposure is 250 ug/100 ml erythrocytes or 100 ug/100 ml blood. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. (1987-1988 adoption) /Lead/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 63] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS: ND

[HSDB] SS 7 /cf?
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NAME OF SUBSTANCE	LEAD
CAS REGISTRY NUMBER	7439-92-1
MOLECULAR FORMULA	Pb **PEER REVIEWED**
BOILING POINT	1740 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 776] **PEER REVIEWED**
MELTING POINT	327.4 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 776] **PEER REVIEWED**
CORROSIVITY	ND
HAZARDS SUMMARY	ND
RADIATION LIMITS AND POTENTIAL	ND

TOXIC HAZARD RATING

A) Evidence for carcinogenicity in human (inadequate). B) Evidence for carcinogenicity to animals ... metallic lead ... /has/ not been tested adequately. /Lead and lead compounds/ [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). 57 238 (1987)] **PEER REVIEWED**

HUMAN TOXICITY VALUES	ND
IMMEDIATELY DANGEROUS TO LIFE OR HEALTH	ND

OSHA STANDARDS

OSHA Permissible Exposure Limit: 50 ug/cu m, 8 hr Time-Weighted Average. /Fumes and dust, as Pb/ [29 CFR 1910.1025 (7/1/87)] **PEER REVIEWED**

OSHA STANDARDS

Meets criteria for OSHA medical records rule. /Inorganic lead/ [29 CFR 1910.20 (7/1/87)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS

NIOSH Recommended Exposure Limit: (100 ug/cu m Time-Weighted Average; air level to be maintained so that worker blood lead remains less than or equal to 60 ug/100 g. Recommendations are based on exposures up to 10 hr. /Inorganic lead/ [NIOSH/CDC. NIOSH Recommendations for Occupational Safety and Health Standards Sept. 1986. (Supplement to Morbidity and Mortality Weekly Report 35 No. 15, Sept. 26, 1986) 215] **PEER REVIEWED**

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 0.15 mg/cu m (1986) /Lead inorganic dusts & fumes, as Pb/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 27] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. /Lead inorganic dusts & fumes, as Pb/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 6] **QC REVIEWED**

THRESHOLD LIMIT VALUES

An identifiable population group might have an incr susceptibility to

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NAME OF SUBSTANCE	CHROMIUM
CAS REGISTRY NUMBER	7440-47-3
MOLECULAR FORMULA	Cr **PEER REVIEWED**
BOILING POINT	2642 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 317] **QC REVIEWED**
MELTING POINT	1900 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 317] **QC REVIEWED**
CORROSIVITY	ND
HAZARDS SUMMARY	ND
RADIATION LIMITS AND POTENTIAL	ND

TOXIC HAZARD RATING

Classification of carcinogenicity: 1) evidence in humans: inadequate; 2) evidence in animals: inadequate. Overall summary evaluation of carcinogenic risk to humans is group 3: The chemical is not classifiable as to its carcinogenicity to humans. /From table, trivalent chromium cmpd/ [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). 37 60 (1987)] **PEER REVIEWED**

HUMAN TOXICITY VALUES ND

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

500 mg/cu m [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 82] **QC REVIEWED**

OSHA STANDARDS

Meets criteria for OSHA medical records rule. /Total chromium/ [29 CFR 1910.20 (7/1/88)] **PEER REVIEWED**

OSHA STANDARDS

8 hr Time-Weighted avg: 1 mg/cu m /Chromium, metal & insol salts (as Cr)/ [29 CFR 1910.1000 (7/1/88)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS ND

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 0.5 mg/cu m (1981) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 17] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists. 1989. , p. 6] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS ND

[HSDB] SS 8 /cf?

USER:

in the BEI value. (1988-1989 adoption) /Cadmium/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 62] ++QC REVIEWED++

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Cadmium in blood (timing is not critical) is 10 ug/l. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. (1988-1989 adoption) /Cadmium/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 62] ++QC REVIEWED++

OTHER OCCUPATIONAL PERMISSIBLE LEVELS ND

[HSDB] SS 3 /cf?
USER:

to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO. February 1987. , p. 68) **PEER REVIEWED**

OSHA STANDARDS

Meets criteria for OSHA medical records rule. /Cadmium dust and cadmium fume/ [29 CFR 1910.20 (7/1/87)] **PEER REVIEWED**

OSHA STANDARDS

8-hr Time-Weighted avg: 0.1 mg/cu m; acceptable ceiling concentration 0.3 mg/cu m /Cadmium fume/ [29 CFR 1910.1000 (7/1/87)] **PEER REVIEWED**

OSHA STANDARDS

8-hr Time-Weighted avg: 0.2 mg/cu m; acceptable ceiling concentration 0.6 mg/cu m /Cadmium dust/ [29 CFR 1910.1000 (7/1/87)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS

NIOSH recommends that the substance be treated as a potential human carcinogen. /Cadmium dust and cadmium fume/ [NIOSH/CDC. NIOSH Recommendations for Occupational Safety and Health Standards Sept. 1986. (Supplement to Morbidity and Mortality Weekly Report 35 No. 15, Sept. 26, 1986) 75] **PEER REVIEWED**

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 0.05 mg/cu m /Cadmium dusts & salts, as Cd/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 14] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. /Cadmium dusts & salts, as Cd/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 6] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Notice of Intended Change (first notice appeared in 1987-88 edition): The ACGIH has listed chemicals for which a limit has been proposed for the first time, or for which a change in the "Adopted" listing has been proposed. The proposed limits should be considered trial limits that will remain in the listing for a period of at least two years. If, after two years no evidence comes to light that questions the appropriateness of the values herein, the values will be reconsidered for the "Adopted" list. Time Weighted Avg (TWA) 0.01 mg/cu m /Cadmium & compounds, as Cd/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 44] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Notice of Intended Change (first notice appeared in 1987-88 edition): A2. A2= Suspected human carcinogen. /Cadmium & compounds, as Cd/ [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1989. , p. 44] **QC REVIEWED**

THRESHOLD LIMIT VALUES

BEI (Biological Exposure Index): Cadmium in urine (timing is not critical) is 10 ug/g creatinine. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl

: - HSDB

NAME OF SUBSTANCE	CADMIUM
CAS REGISTRY NUMBER	7440-43-9
BOILING POINT	765 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 223] **PEER REVIEWED**
MELTING POINT	321 DEG C [The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. , p. 223] **PEER REVIEWED**
CORROSIVITY	Highly corrosion resistant [Sittig, M. Handbook of Toxic And Hazardous Chemicals. Park Ridge, NJ: Noyes Data Corporation, 1981. , p. 119] **PEER REVIEWED**

HAZARDS SUMMARY

The major hazards encountered in the use and handling of cadmium stem from its toxicologic properties. Toxic primarily by inhalation and ingestion, exposure to cadmium (salts, dust, or fumes) may occur from the smelting and refining of ore, and from its use in metal plating and coating, production of batteries, synthesis and use of cadmium-containing pigments, soldering, and in plastics, ceramic glazes, alloys, and amalgams. Effects from exposure may include headache, nausea, shortness of breath, chest pain, weakness, fever, kidney damage, liver damage, chronic bronchitis, emphysema, and pulmonary edema (possibly resulting in death). NIOSH has recommended that cadmium (dust and fumes) be treated as a potential human carcinogen. Further, the ACGIH has placed cadmium on its 1987-88 TLV Notice of Intended Change List as a suspected human carcinogen. The OSHA PEL for cadmium fume is 0.1 mg/cu m, and for cadmium dust is 0.2 mg Cd/cu m. Neither odor, nor irritation potential serves as an adequate warning of over-exposure. Processes and operations which may release cadmium fumes or dust should be enclosed and fitted with exhaust ventilation if practicable. Workers should wear a high efficiency particulate filter respirator or self-contained breathing apparatus in activities where over-exposure is possible. Protective clothing and gloves also should be worn, and these should be removed before leaving work. If contact should occur, immediately wash contaminated skin with large amounts of water. Do not eat, smoke, or drink in work areas. Cadmium dust or powder is a moderate firehazard when exposed to heat (autoignition temperature: 250 deg C) or flame, or by chemical reaction with oxidizing agents, metals, hydrogen azide, zinc, selenium, or tellurium. Wear a self-contained breathing apparatus when fighting such fires. Cadmium should be stored in closed containers, away from sources of physical damage. Consult the regulatory requirements of the U.S. Department of Transportation before shipping cadmium, and with environmental regulatory agencies before implementing land disposal of cadmium wastes. **PEER REVIEWED**

ODOR THRESHOLD	ND
SKIN, EYE AND RESPIRATORY IRRITATIONS	ND
RADIATION LIMITS AND POTENTIAL	ND
TOXIC HAZARD RATING	ND
HUMAN TOXICITY VALUES	ND

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

NIOSH has recommended that cadmium dust (as Cd) be treated as a potential human carcinogen. /Cadmium dust (as Cd)/ [NIOSH. Pocket Guide

Switzerland, 0.2 mg/cu m; Sweden 0.05 mg/cu m; and Italy 0.25 mg/cu m. /Arsenic and soi comp/ (American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1986. , p. 371 **PEER REVIEWED**

[HSDB] SS 4 /cf?
USER:

: - HSDB
NAME - ARSENIC

[HSDB] SS 4 /cf?
USER:
PRT NAME INDENTED COMPRESSED CONTINUOUS CHEMINFOPRT INDENTED COMPRESSED CONTINUOUS CHEMINFO

: - HSDB

MOLECULAR FORMULA	As **PEER REVIEWED**
BOILING POINT	ND
MELTING POINT	817 DEG C @ 28 ATM [Weast, R.C. (ed.) Handbook of Chemistry and Physics. 68th ed. Boca Raton, Florida: CRC Press Inc., 1987-1988. B-73] **PEER REVIEWED**
CORROSIVITY	ND
HAZARDS SUMMARY	ND
RADIATION LIMITS AND POTENTIAL	ND
TOXIC HAZARD RATING	ND
HUMAN TOXICITY VALUES	ND

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

NIOSH has recommended that arsenic be treated as a potential human carcinogen. [NIOSH. Pocket Guide to Chemical Hazards. 2nd Printing. DHHS (NIOSH) Publ. No. 85-114. Washington, D.C.: U.S. Dept. of Health and Human Services, NIOSH/Supt. of Documents, GPO, February 1987. , p. 5A] **PEER REVIEWED**

OSHA STANDARDS

8-hr Time-Weighted avg: 5 ug/cu m. /Inorganic arsenic/ [29 CFR 1910.1018 (7/1/87)] **PEER REVIEWED**

NIOSH RECOMMENDATIONS

NIOSH recommends that the substance be treated as a potential human carcinogen with a 15 minute TWA: 2 ug As/cu m. /Inorganic arsenic/ [NIOSH/CDC. NIOSH Recommendations for Occupational Safety and Health Standards Sept. 1986. (Supplement to Morbidity and Mortality Weekly Report 35 No. 1S, Sept. 26, 1986) 5S] **PEER REVIEWED**

THRESHOLD LIMIT VALUES

Time Weighted Avg (TWA) 0.2 mg/cu m (1988) [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists. 1989. , p. 12] **QC REVIEWED**

THRESHOLD LIMIT VALUES

Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. [American Conference of Governmental Industrial Hygienists. Threshold Limit Values and Biological Exposure Indices for 1989-1990. Cincinnati, OH: American Conference of Governmental Industrial Hygienists. 1989. , p. 6] **QC REVIEWED**

OTHER OCCUPATIONAL PERMISSIBLE LEVELS

... The following countries had adopted the ... TLV of 0.5 mg/cu m: Austria, Belgium, Finland, Japan, and Holland. Czechoslavakia, East Germany, Hungary and Poland ... USSR ... 0.3 mg/cu m: Romania and

AMERICIUM

(NOTE: NO INFORMATION WAS AVAILABLE ON AMERICIUM THROUGH THE HAZARDOUS SUBSTANCES DATA BASE. SINCE AMERICIUM IS A DECAY PRODUCT OF PLUTONIUM, AND ALSO AN ALPHA EMITTER, THE HAZARDS ARE DEEMED TO BE SIMILAR FOR THIS PROJECT. REFER TO THE CHEMICAL PROFILE FOR PLUTONIUM.)

APPENDIX A

HEALTH HAZARDS OF PRIMARY CONTAMINANTS:

METALS:

Americium
Arsenic
Cadmium
Chromium
Lead
Nickel
Plutonium
Silver
Uranium

ORGANICS:

2-Butanone (Methyl Ethyl Ketone)
Tetrachloroethylene (Tetrachloroethene)

INORGANICS:

Hydrogen Cyanide (for Total Cyanides)
Hydrogen Sulfide

NOTES FOR APPENDIX A:

ACGIH = American Conference of Government Industrial Hygienists
mg/cu m = Milligrams per cubic meter
ND = No Data
NIOSH = National Institute for Occupational Safety and Health
OSHA = Occupational Safety and Health Administration
TLV = ACGIH Threshold Limit Value for Occupational Exposure

The information presented in the following chemical profiles is applicable for relatively pure and concentrated quantities of the subject chemicals. The health hazards from exposure to low concentrations of mixtures of these chemicals is not well documented, and scientifically unknown. However, due to the trace concentrations in ppm levels of the chemicals in the solar ponds and sludge, the actual health risk is believed to be substantially less than the information presented herein. This has been discussed in Section 3.2.2 which covers the hazard assessment for the hazardous substance concentration, forms present, and working conditions anticipated for this remediation project.

SECTION 15.0 LABORATORY HEALTH & SAFETY PLAN

HNUS will establish an on-site laboratory to support the Solar Ponds processing. The laboratory will be located in the Permacon in Tent No. 5 on the 750 Pad. Laboratory operations are described in Solar Ponds Project Deliverable Document No. 316, On-Site Laboratory SOP.

Health & safety procedures for the laboratory will be generally conducted in accordance with the Chemical Hygiene Plan for Halliburton NUS Environmental Corporation laboratory Services Group (LSG), dated November 8, 1991. The Chemical Hygiene Plan (CHP) will be integrated with the Health & Safety Plan (HASP) as follows:

- The HNUS-LSG on-site Group Leader per CHP 1.2.4 is Frank B. Stencer.
- The LSG on-site laboratory Receiving Clerk per CHP 13.2.2 is Dave Elkin.
- The HNUS Chemical Hygiene Officer is Robert Lynch (available through 412/747-2506).
- Training records for the LSG on-site laboratory personnel referenced in CHP 9.4 are available through the HNUS Site Health & Safety Supervisor.
- Emergency response procedures described in the CHP Section 5.2.3 and 8.3 are supplemented with HASP Section 13.0 with regard to reporting of emergencies, and notification of spills.
- Material Safety Data Sheets for hazardous materials use in the LSG on-site laboratory will be maintained in the laboratory.
- A copy of the HASP will be maintained in the laboratory.
- Waste disposal procedures per CHP 10.0 and 13.3.2 for the Lsg on-site laboratory will be conducted as directed by EG&G.
- The CHP Appendix I describing the LIMS Chemical Inventory is not applicable for the LSG on-site laboratory.
- Personal Protective Equipment (PPE) referenced in CHP 6.1, 6.2, and 6.3.1.1 through 6.3.1.3 for the LSG on-site laboratory personnel will be determined per HASP procedures, and PPE will be supplied by EG&G.
- The CHP 8.4 and CHP Appendix D regarding records of accidents is supplemented by HASP 13.10.

SECTION 14.0 RCRA PERMITS

14.1 OVERVIEW

As a hazardous waste treatment and storage facility site, operations fall under the regulatory requirements of EPA's Resource Conservation and Recovery Act and the State of Colorado's hazardous materials regulations. As operations and activities change at the site, this Health and Safety plan will be revised as necessary.

The facility is currently in an interim permitting status in accordance with EPA regulations (40 CFR, Part 265) and Colorado Hazardous Waste Regulations (6CCR 1007-3, Part 265). As operations or site conditions change, the permit limitations or operating standards may need to be amended by EG&G. There is no intention to permit this treatment unit under the facility Part B permit. Interim Status for this unit will terminate in November 1992.

ITEM DESCRIPTIONS

EMPLOYEE INJURY/ILLNESS INFORMATION

Shift: Time of day shift begins. Use 24-hour clock notation. (See time of accident.)
Status: F - Regular full time; P - Regular part time; T - Temporary; N - Non-employee; C - Contractor.
Nature of injury/illness: Type of physical injury or illness incurred, e.g., cut, burn, bruise, fracture, sprain, etc.
Body part(s) affected: Part of the injured person's body directly affected by injury or illness, e.g., eye, ear, back, wrist, knee, etc.

ACCIDENT DESCRIPTION

Time of Accident:
Based on 24-hour clock, e.g., 1:00 a.m. — 01:00, 1:50 p.m. — 13:50, 11:30 p.m. — 23:30.

Accident Location:
Identify exact building, Production unit, e.g., 156,177, 120, etc., or section and area in which the accident occurred. For example, Section 7, Bldg.12, F side filter press.

Accident sequence:
Briefly describe, in your own words how the accident happened, including events that led to the accident. Include in your description the accident type and accident agency, examples of which follow:

Accident type:
Event which directly resulted in injury, e.g., struck against; struck by; fall from elevation; fall on same level; caught in, under, or between; rubbed or abraded; bodily reaction; overexertion; contact with electric current; temperature extremes; radiations, caustics, toxic and noxious substances.

Accident agency:
Object, substance, or part of premises in which the hazard condition existed and/or injury occurred, e.g., boiler, reactor, chemical, crane, etc.

ACCIDENT ANALYSIS

Accident causes:
Specifically identify employee, supervisory, equipmental, and environmental insufficiencies or hazards which may have contributed to the accident. Try to use the guidelines below as a reference.

Employee Contributing Factors:

- **Physical Limitation** — Any medical condition, diagnosed prior to the accident, that required the employee to avoid certain activities.
- **Deficient in Skill or Ability** — Includes abnormal mental condition, except where caused by drugs or alcohol.
- **Influence of Drugs or Alcohol**
- **Lack of Alertness** — Includes fatigue.
- **Failure to Follow Written Procedure or Rule** — This is a general category which includes "test devices not used," "working with energized equipment," "improper method," "failure to obtain safe work permit," etc., if a written procedure exists.
- **Failure to Follow Oral Instructions.**
- **Failure to Use Personal Protective Equipment.**
- **Operating Without Authority.**
- **Taking an Unsafe Position** — Includes improper use of hand or body parts, using hands instead of tools.
- **Unsafe Speed, Haste, Short Cut** — Includes running.
- **Improper Use of Tool, Equipment, Material.**
- **Use of Incorrect Tool, Equipment, Material.**
- **Improper Manual Material Handling** — Includes unsafe lifting and carrying, stacking, piling, placing, opening, mixing, loading, spilling, over-filling.

Supervisory Contributing Factors:

- **Incorrect/Incomplete Procedures, Instructions.**
- **Rules, Procedures, Work Methods not Enforced.**
- **Inadequate Training of Employee(s).**
- **Proper Tools, Equipment Not Provided.**
- **Deficient Storage/Material Handling Practices** — Includes slippery floors and walkways.
- **Too Much Rush on Job.**

Equipment/Materials Contributing Factors:

- **Defective Equipment, Tool, Material.**
- **Inadequate or Missing Guards.**
- **Inadequate or Bypassed Safety Devices.**
- **Inadequate Maintenance, Equipment Inspections.**
- **Inadequate Lighting.**
- **Inadequate Ventilation.**
- **Inadequate Design/Layout** — Includes inadequate instruments, insufficient/congested work space, or specification of improper materials.
- **Inadequate Fabrication/Installation** — Includes installation of improper or inadequate materials of construction, improperly finished surfaces (sharp, rough), etc.

Environment Contributing Factors:

- **Horseplay/Distraction by Co-Worker.**
- **Error by Co-Worker.**
- **Unsafe Equipment/Materials/Action of Third Party.**
- **Upset Conditions** — Fire, Explosion, Spill, etc. — Includes uncontrolled reactions, previously unknown chemical reactions, and foreign substances present.
- **Exposure to Chemical/Physical/Biological Agents** — Including noise.
- **Weather** — Rain, Snow, Ice, Wind, etc. — Includes natural disasters.

Figure 13-1 (cont'd)

HALLIBURTON NUS
Environmental Corporation

FAX TO: 713-561-8138
PHONE: 1-800-364-1556 or 713-561-1556

FIRST REPORT OF ACCIDENT

Please print all information

TO BE FILLED OUT BY INDUSTRIAL HYGIENE AND SAFETY DEPARTMENT:
Accident Classification:
[ ] No Injury [ ] First Aid [ ] Damage or Loss
OSHA Log Entry:
[ ] Recordable [ ] Lost Workday [ ] Lost Time

Project Location | Case No.

EMPLOYEE INJURY/ILLNESS INFORMATION

Name (Last, First, M.I.) | Social Security No. | Age | Sex

Dept or Employer | Shift* | Status* | HNUS Service (Yrs.) | Employment Experience (Yrs.)

Regular Occupation | Occupation when injured or ill | Occupation Experience (Yrs.)

Nature of Injury/Illness* | Body Part(s) Affected*

Hospital Telephone No. | Doctor Telephone No. | [ ] Return _____ Days [ ] Restricted _____ Days [ ] Off Work

ACCIDENT DESCRIPTION

Date Reported | Date of Accident | Time* | Accident Location & Unit | Witness

Job Being Done: | Frequency: | Last Time:

Accident Sequence

Property Damage or Product Loss (If Yes, Explain) [ ] No [ ] Yes

Estimated Property Loss $

ACCIDENT ANALYSIS/CAUSAL FACTORS*

Employee/Supervisory Contributing Factors

Job or Equipment Contributing Factors

Environment Contributing Factors

Was the Job Covered by a Written Safety Procedure or a Activity Hazard Analysis?	Was the Procedure or AHA Followed?	Was the Injured Instructed in This Procedure/AHA?	Should the Procedure/AHA Be Written/Revised?
[ ] Yes [ ] No	[ ] Yes [ ] No	[ ] Yes [ ] No	[ ] Yes [ ] No

MANAGEMENT ACTION AND REVIEW

Supervisor Action to Prevent Similar Accident (Note A.T. for Actions Already Taken)

Supervisor's Signature & Date

Further Action of Project Manager or On-Site Supervisor and/or Follow-up Required

FOR PROJECT WORK:

On-Site Supervisor's Signature & Date | Project Manager's Signature & Date

* See reverse side for Descriptions and Guidelines

HNUS FORM _____ REVISION _____

Figure 13-1

13.10 ACCIDENT AND FIRST AID CASE REPORTING

Halliburton NUS Environmental Corporation recently implemented a new form for reporting accident and first aid cases. This form will be used to record any and all accidents and injuries. The forms will be forwarded to the Houston office of HNUS which serves as a data collection and distribution point.

TABLE 13-2

HNUS EMERGENCY CONTACTS AND TELEPHONE NUMBERS

AGENCY	CONTACT	TELEPHONE NUMBER
Local Medical Emergency	On-Site	966-2911
Fire Department	On-Site	Extension 2911
Security	Security	Extension 2911
HNUS Deputy On-Site Project Manager	John Schmidt	303-466-3573 (Office [redacted] (Home)
HNUS Operations & Maintenance Supervisor	Jim DePriest	303-466-3573 (Office) [redacted] (Home)
HNUS Health & Safety (Denver)	Ron Hill	303-466-3573 (Office) [redacted] (Home)
HNUS Corporate Health & Safety (Houston)	Tom Samson	713-561-1556 (Office) [redacted] (Home)

TABLE 13-1

EG&G LINE OF RESPONSIBILITY FOR SEP SITE

TITLE	NAME	TELEPHONE NUMBER	PAGER NUMBER
Project Manager	Don Ferrier	966-6456	1841
Operations Manager	Joe Roberts	966-6129	3562
Deputy Operations Manager	Steve Dewitt	966-4433	0384
Site Operations Supervisor	Dean Pierson	--	1369
Shift Manager	Charles Turner	966-5755	4001
Health & Safety Area Administrator	Pat Stephens	966-4831	3307
Off-Shift Health & Safety Area Administrator	--	966-4869	9290

13.9 EMERGENCY TELEPHONE NUMBERS

Telephone numbers of other departments and personnel that may be needed in the event of an emergency are listed below:

- ★ **INDUSTRIAL HYGIENE 2780**
- ★ **RCRA/CERCLA 5251**
- ★ **RESPONSE & REPORTING 7274**
- ★ **SECURITY 2444**
- ★ **RADIOLOGICAL ENGINEERING/ RADIOLOGICAL OPERATIONS 2841, 2842**

RADIATION PROTECTION AREA MANAGEMENT

- ★ **DAY: Richard Norton Phone 4075 . . . . . Pager 0971**
- ★ **OFF-SHIFT RADIATION PROTECTION . . . . . Pager 9290**
- ★ **AREA MANAGEMENT SHIFT SUPPORT Phone 4869**

Floor Dry from the Pad. The collected material will be placed back into the processing units for stabilization. Based on existing monitoring and analytical data, all spilled material is expected to be low-level radioactive waste.

13.6 POST-EMERGENCY RESPONSE EQUIPMENT MAINTENANCE

Equipment will be decontaminated by wiping with a soap solution. Rags used for decontamination will be disposed of as low-level radioactive waste if they cannot be put into the process stream for stabilization. Equipment will not be released until the monitoring indicates that contaminant levels are less than 20 dpm/100 cm^2. Operations on the pad that are in the vicinity of the spill, or that could potentially be effected by a contaminant release will be shut down.

13.7 EMERGENCY EQUIPMENT LOCATION

Spill response equipment will be stored On-site in a portable container. The container is 2' x 4' x 7' and is moved where it is needed by a forklift. The spill response kit for the SEP site is located in the Building 788 maintenance office. The response kit contains a generator, a wet/dry vacuum, disposable towels, KW solution and personal protective equipment.

13.8 EVACUATION PLAN

Personnel and visitors at the site will evacuate the pad if any of the following occur:

- If instructed by the Life Support/Plant Warning (LS/PW) Public Address System
- If instructed by site supervisor
- High winds per 3.4.4.

The assembly point for the site will be relayed to personnel during training. After an evacuation, the supervisor is required to verify that all employees under their supervision are accounted for.

area. Additionally, HAZMAT should be notified if potential safety or health hazards (i.e. fire, explosion, or chemical exposure) exist. If the hazards associated with cleaning up the quantity of material is not known, or the connect PPE selection is not known then HAZMAT should be called. Examples of situations that may require HAZMAT response include:

- Propane leak
- Propane fire/explosion
- Forklift battery acid spill

13.4 RESPONSE AND CONTROL PROCEDURES

FIRES AND EXPLOSIONS -- CALL 2911

Propane is used to heat the tent structures on the pads. Due to the nature of propane, the possibility of a fire exits, although it is extremely unlikely. In the event of a propane leak or fire, personnel will immediately evacuate the site, the tent and the Pad. Notify the Fire Department by calling extension **2911**. Site personnel will not attempt to assist in abating the hazard. The emergency will be handled by the Fire Department and their designees.

No other highly flammable materials are known to be used or stored at the site. Fire extinguishers are available for use on small, controllable fires. Notify the Fire Department in the event of a fire, no matter how minor.

13.5 STORAGE AND TREATMENT OF RELEASED HAZARDOUS AND RADIOACTIVE MIXED WASTE

REPORT TO EG&G EMERGENCY COORDINATOR AT EXTENSION 2911 all spills greater than one pint or one pound of a hazardous substance or greater than 15 ft^3 of stabilized Pondsludge. The EG&G Emergency Coordinator will dispatch the HAZMAT Response Vehicle and any other support personnel necessary.

For spills that can be handled by site personnel, spilled liquid will be absorbed with "Floor Dry" or similar absorbent materials. A HEPA-filtered wet/dry vacuum will be used to remove the spill and

his/her discretion, the EC may activate the Emergency Operation Center (EOC) and notify departments that have an advisory role in the situation. The EC will determine if additional help from off-site agencies (police, hospitals, etc.) is required.

The EC will then notify the following groups when appropriate:

RADIOLOGICAL ENGINEERING	**INDUSTRIAL HYGIENE**
INDUSTRIAL SAFETY	**WASTE OPERATIONS**
WASTE PROGRAMS	**TRAFFIC**
EVENT NOTIFICATIONS OFFICE	**H&S OPERATIONS**

Radiological Engineering and Industrial Hygiene will assess any hazards associated with the release of spilled product. Waste Operations will contain and clean up spills. Waste Programs will evaluate the incident for RCRA/CERCLA reporting requirements. Notification must also be made to Response and Reporting at extension 7264.

SEE TABLE 13-1 FOR THE LINE OF RESPONSIBILITY FOR EG&G PERSONNEL AND THEIR TELEPHONE NUMBERS. TABLE 13-2 LISTS HNUS CONTACTS.

13.3 SPECIFIC SITE HAZARDS

Incidental releases of hazardous substances can be performed with minimal risk to personnel if correct procedures are followed. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized or otherwise controlled at the time of release can be performed by employees in the immediate release area, if the responders are familiar with the potential safety and health hazards associated with the spill clean-up, and the appropriate precautions and personnel protective equipment is used.

An example of incidental releases/spills that can be handled by site process personnel include:

- Pondsludge or SEP material spills
- Spills of other hazardous substances where the responders are familiar with the hazards (and PPE selection) associated with cleaning up the quantity of material spilled.

  The HAZMAT team should be notified at extension 2911 if the spill or release of the hazardous substance can not be absorbed, neutralized or otherwise controlled at the time of release by employees in the immediate release

Call 2911 for emergency assistance for life-threatening emergencies to access the:

- ★ Emergency Coordinator (Shift Superintendent)
- ★ Plant Protection Central Alarm Station
- ★ Fire Department Dispatch Center
- ★ Occupational Health Department

Provide as much detail about the emergency as possible. A decision to dispatch any or all of the following equipment will be made on the information provided:

- ★ Fire Engine/Equipment
- ★ Ambulance
- ★ Hazmat Response Vehicle

Provide the following information, upon request, to the qualified Emergency Dispatcher:

- ★ Your name
- ★ Building number
- ★ Exact location of the emergency (Pad #, nearest trailer, etc.)
- ★ Nature of the emergency
- ★ Condition of patient if applicable (breathing, consciousness, bleeding, etc.)
- ★ Special hazards in the area
- ★ Any other information requested

If no details are given, emergency response personnel will respond automatically.

The Emergency Coordinator (EC) will immediately respond to all emergency alerts and alarms. The Plant Protection Central Alarm Station will activate the Building Emergency Support Team (BEST) by the Life Support/Plant Warning (LS/PW) Public Address System. At

SECTION 13.0 EMERGENCY RESPONSE

13.1 PURPOSE

The purpose of the Emergency Response Plan is to have a detailed pre-determined strategy for handling emergency incidents and potential problems. This pre-emergency planning will aid in immediate response and abatement of problems and will likely reduce the severity and impact of the situation. The plan is designed to protect site personnel from potential hazards created by an emergency situation. In addition to safeguarding site personnel, the plan is designed to protect plant personnel and the public from contaminants that could potentially move off site, protect property adjacent to the process site from potential hazards on the pad, and prevent equipment loss as a result of fires, explosions or contamination.

It is critical that key personnel are informed immediately of emergency situations so that response efforts can be carried out effectively. Success will depend on the efforts of appropriate personnel and the input they can provide as result of training and experience. Teamwork is crucial for abating hazards and minimizing damage. Emergency assistance should always be requested when it is unclear whether there is a need for support personnel. This section details procedures to be followed during an emergency.

13.2 NOTIFICATION

LIFE THREATENING EMERGENCIES - CALL EXTENSION 2911

NON-LIFE THREATENING EMERGENCIES - CALL EXTENSION 2914

Notification requirements for emergency situations on the site, depend on the nature of the perceived emergency (e.g. spill, injury, illness or fire) and the extent to which the damage and/or injuries have progressed. Upon delivery of a release of materials or other non-life-threatening emergency situation, immediately notify the On-site supervisor at extension 6055 and the H&S Area Engineer at extension 7571. The supervisor will evaluate the situation and notify appropriate personnel. If the supervisor is not available, or the situation is life-threatening, notify RFP emergency response personnel as described below.

TABLE 12-1
EVALUATION PROCEDURES BY EG&G DEPARTMENT

PRODUCTS OR TECHNOLOGIES	DEPARTMENT
Chemical Protection Clothing & Respiratory Protection	INDUSTRIAL HYGIENE
Protection Equipment used to protect against falls, impacts, explosions & related safety concerns	INDUSTRIAL SAFETY, ENGINEERING
Radiation Safety Protective Equipment	RADIOLOGICAL ENGINEERING
Chemical Exposure Monitoring	INDUSTRIAL HYGIENE
Radiation Exposure Monitoring	RADIOLOGICAL ENGINEERING
Fugitive Particulate & Vapor Emission Controls Engineering	INDUSTRIAL HYGIENE, RADIOLOGICAL ENGINEERING
Chemical or Radiological product spill containment, neutralization, stabilization, evaporation and storage	RADIOLOGICAL ENGINEERING, ENGINEERING
Material Handling	INDUSTRIAL SAFETY, ENGINEERING